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Telephony.

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Telephony.

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TELEPHONE RATES AND POLITICS

Looking back on the national telephone convention, we seem to see and hear nothing but CO-OPERATION. It's a good, solid word and means much, but is most effective when put into practice.

The late lamented "B. L. T."—the best newspaper humorist of his day—created what he whimsically called the "cannery," for the storage of over-worked words and phrases, and used to lend them out to the spell-binders who could not get along without them, but with the express understanding they were to be returned.

Nearly every speaker at the Chicago meeting last week emphasized the necessity for *co-operation* in the telephone business, and if the word was afterwards sent back to the "cannery" it must have arrived in a tattered condition. But if all the shrewd advice advanced about co-operation is put into effect, there will be a mighty move forward in the industry, for it is sound gospel. Co-operation gets things done.

* * * *

The national association was urged to co-operate with the state associations, and the state organizations were besought to co-operate with one another. Member companies were told to co-operate with their local newspapers for publicity purposes, with their subscribers, and with the rate commissions. Finally, the Independents were advised to co-operate with the Bell group, and Vice-President Hall assured the convention that his organization (the Bell system) would co-operate with the Independents in every way possible.

Instead of "Navy week" it was "Co-operation week," at least among the telephone fraternity, and it is to be hoped that the slogan will be carried along throughout the coming year and produce beneficial results for the business.

The right co-operaion will secure needed rate adjustments, put "pep" into managers and their workers, improve service and strengthen public relations. Let the telephone associations and their member companies co-operate along these lines twelve months in the year, and most of their difficulties will disappear.

* * * *

There is no particular magic in the word co-operation. In many other lines of industry co-operative enterprises are unusually popular just now. There are co-operative stores, co-operative apartment buildings, and in some states farmers are forming new co-operative agencies for the handling of their products.

It will require intelligence, hard work and good management to make these co-operative projects succeed, just as intelligence, hard work and good management are needed to make other business ventures succeed.

There is no lack of any of these ingredients in the telephone field, although many will confess there is still room for improvement along the line of management. There has always been plenty of hard work in evidence, anyway.

Co-operation will help to utilize the intelligence and the hard work to produce more efficiency, and obtain for the industry more of the rewards to which it is entitled—meaning better service rates in most cases.

* * * *

Men in the Independent telephone business have a real responsibility in doing their part towards supplying telephone service to the public. They are an important factor in this important utility industry. They have been for many years. It is largely due to their enterprise and labor that the telephone has reached the tremendous development it has achieved in America, which, as everybody knows, leads the world so far that there is no comparison.

* * * *

Vice-President E. K. Hall told the convention that the Bell has no desire for a monopoly of the telephone business; that it realizes such a job would be too big for any one organization; that there must be two distinct groups engaged in the industry.

That was interesting, and pleasant, and reassuring to hear, but the Independents knew it and believed it whenever they stopped to analyze the situation.

The same thought was expressed at a meeting of the Up-State Telephone Association of New York, held at Syracuse October 17, by an officer of the New York Telephone Co., who said in an address:

"No one man, no group of men, can possibly carry the load in the future days insofar as the development of the telephone art goes. It must be divided."

The future growth of telephone service will tax the capacity of both Independent

and Bell groups for years to come. The demand for service increases faster than does the growth of population, and the public will constantly require more efficient service.

Of course, the public should pay more for a better standard of service, and it is up to the operating companies to work toward that end. Telephone service is too cheap today, when compared to its essential value to business and social life, and the plain facts, when properly presented, will so convince the average community.

More attention should be paid to educating the public to the *value* of service, and making them understand what they are paying for—or partly paying for—when they pin a check to a telephone bill.

* * * *

The average telephone user has little conception of the money invested in the enterprise which enables him to carry on a conversation over the wires. He sees the receiver and transmitter set he uses, and knows there must be an operator somewhere who, in some way—mysterious to him—handles his call, but he knows little, and never stops to think, of the details, expensive and complicated, which necessarily go to complete the telephone system he uses many times a day.

* * * *

It is information about these matters that operating companies and telephone associations should lay before the general public. The associations should plan systematic campaigns for placing such facts before people, and the individual companies should overlook no opportunity to "feed" this information to their local newspapers. This gradual building up of the public's education regarding the telephone business will make it easier to get adequate rates for service.

* * * *

Apparently not every community is kicking and accusing the telephone company of charging exorbitant rates. The Downing Telephone Co., operating at Downing, Mo., is serving a reasonable people, for in a letter to TELEPHONY renewing its subscription, occurs this postscript:

"Frequently some will say they do not see how we could furnish first-class telephone service at the present rates during the period just passed through."

E. E. St. Clair, the purchasing agent of the company, proceeds to explain by adding: "Well, you see we read TELEPHONY and try to profit by what we read. It helps, believe me."

* * * *

The business man who carefully and regularly reads his trade paper and applies its advice and suggestions will find himself better equipped to succeed in his work. Incidentally, it is gratifying to note that this journal has helped a telephone company to give satisfactory service. That is what we are here for.

"Wired Wireless"—Line Radio

History of Wired Wireless—Multiplex Telephony by Superimposition of Modulated Radio Currents on Wire Lines—Broadcasting over Telephone Lines—Paper Presented at Meeting of U. S. Independent Telephone Association

By Major J. A. Mauborgne
United States Signal Corps

Four or five years ago, the average telephone man gave scarcely any consideration to the subject of linking together radio telegraphy and telephony with wire line telephone systems. Multiplexing methods based upon the older arts of telegraphy, by which a multiplicity of telegraph messages were superimposed upon telephone circuits, were about the only combination in practical use, so far as telegraphy was concerned, and, for straight telephony, the use of the phantom circuit afforded practically the only means for securing an additional telephone circuit over two physical telephone circuits.

Of course, there were a number of men in the telephone field who were interested in radio as a purely separate means of communication, but these men grew up in the radio world, ordinarily without linking together the wire and the radio circuits, of which they had a working knowledge.

Today we are forced to the conclusion that, henceforth, the telephone engineer must seriously study radio telegraphy and telephony, for "wired wireless" has come to stay, and the telephone engineer must be awakened to the possibilities of this later art, if telephone companies are to take advantage of the opportunities for multiplexing their lines, at a considerable saving of copper; of furnishing additional channels for broadcasting over their lines, and of making a careful study of the situation created by the immense demand for radio antennae, in apartment houses, hotels, and other congested places, which would permit their subscribers to make use of their lines as antennae for the reception of broadcasting, sent not only over their lines proper, but of material broadcast through the ether by radio stations, in the normal way.

At a gathering of this sort, one cannot impose upon the good nature of his hearers by presenting the whole history of any art or going into all its ramifications. I deem it impracticable to present for your consideration an outline of the fundamental principles of radio telegraphy and telephony such as is really required for the student of "wired wireless," prior to a discussion of this later art. Excellent articles dwelling on radio fundamentals have recently appeared in some of the monthly telephone publications. I feel, however, that there is no telephone man here present who has not, at least, some knowledge of how radio transmission and reception are carried out.

I shall attempt to confine my remarks, therefore, in the brief time I have at my disposal, to a discussion of "wired wireless" in its simplest form, and to explain and demonstrate, if time and circumstances permit, how multiplex telephony may be accomplished by the superimposition of modulated radio currents on telephone and lighting lines and, also, to dwell for a short time on the possibilities of applying Major General Squier's inventions connected with broadcasting over telephone lines, as well as on the use of such lines as antennae, and on the part to be played by telephone companies in such application.

"Wired wireless" is, perhaps, the best known term and the oldest term applied to the system of multiplex telephony and telegraphy employing high frequency currents on wires. It has been variously called "carrier wave" telephony, "wire radio," "line radio," and many other names purporting to give a more or less correct description of what actually takes place when this system is used.

For many years after its discovery by Major General George O. Squier, the pres-

ent chief signal officer of the army, in 1909, it bore the name "wired wireless," although its inventor at present prefers the title "line radio," as distinguishing it from "space radio" which latter term is sufficiently descriptive to require no further explanation.

"Wired wireless" was first achieved by Major General George O. Squier (then Major Squier) during the years 1909 and 1910. In November, 1910, General Squier filed fundamental patent applications on the "wired wireless" art, on which patents were allowed in the year 1911. In this same year, he published a paper on "Multiplex Telephony and Telegraphy" which marked an epoch in the scientific progress of the telephone and telegraph art.

Many inventors, prior to General Squier's work, had been engaged upon the problem of multiplex telephony and telegraphy, but all of the ideas underlying the schemes which hitherto had been proposed, were based, almost without exception, upon the principles and practices of the old telephone art. The great advance made by General Squirer and that which made the use of high frequency (radio) carrier currents successful was the combined utilization of tuned radio circuits and a detector or rectifier at the receiving terminal.

Major J. A. Mauborgne, for a Number of Years Executive of the Signal Corps Engineering Department in Washington, Was Very Closely Associated with Major General George O. Squier in "Wired Wireless" Experimental Work.

For this transmitter, he used a high frequency alternator which he coupled by means of a radio circuit, either directly or inductively to a telephone line and, at the receiving end, by means of properly tuned circuits, and, with a detector—first of the crystal type and, then, in 1910, of the audion or valve type—he first demonstrated the practicability of transmitting speech over a wire without that speech being heard by the ordinary telephone instruments attached to the same wire. By this achievement, the common principles of the radio art were immediately made available to the older wire systems and a new method of transmission of intelligence was created.

Upon the announcement of the invention, a number of engineers attacked his proposal and maintained, after mathematical analysis, that the attenuation of the high frequency currents on the wires would make the scheme impracticable for multiplex telephony. It is to be noted, however, that the comments of the engineers mentioned were made in the days when modern radio amplifiers did not exist. It is to be noted, also, that these same engineers proceeded at once to experiment with the proposed system.

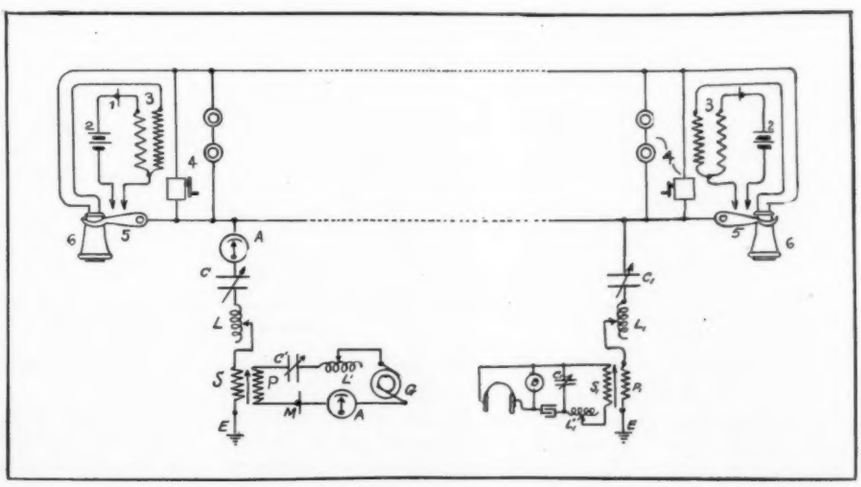


Fig. 1. Application of Principle of Superimposing a Radio Frequency Transmitter and Receiver on Standard Local Battery Telephone Line.

The modern amplifier makes possible the reception of extremely small amounts of energy and the magnification of the sounds produced thereby, so as to give strong signals. The high frequency alternator used by General Squier was, at the time of his invention, in the experimental stage, and did not appear to afford a practicable solution as a source of energy for commercial multiplex telephony. It was not until the arrival of the three-electrode vacuum tube as a generator of high frequency current that real progress was made toward the practical realization of the scheme. The practical development of the new art of utilizing low-frequency carrier currents and the solution of the actual problems of making a practical multiplex telephone circuit have now been carried to an advanced and commercial stage, and long distance telephone and telegraph lines employing the system are in daily operation between a number of large cities.

In this country, great honor is due to the research staffs of the Western Electric Co. and the American Telephone & Telegraph Co. and, particularly, to E. H. Colpitts and C. B. Blackwell, for the development of a practicable system. That this country is not alone in the development of this new art is evidenced by the publications of Wagner, Faszbender and Habann, in Germany, and of Marumbo in Japan. The first two papers mentioned contain interesting accounts of the development of wired radio apparatus in Germany during the war; the latter paper, though quite brief, is also of great interest, as it contains descriptions of methods and apparatus used where a high voltage power line was employed for transmission means.

A very excellent contribution to the literature on the subject of "wired wireless" is to be found in the paper by E. H. Colpitts and C. B. Blackwell, which is recommended to those who are se-

riously inclined toward the study of "wired wireless." This paper very well outlines the method of carrier current telephony used by the Bell companies today.

In the Signal Corps of the army, very

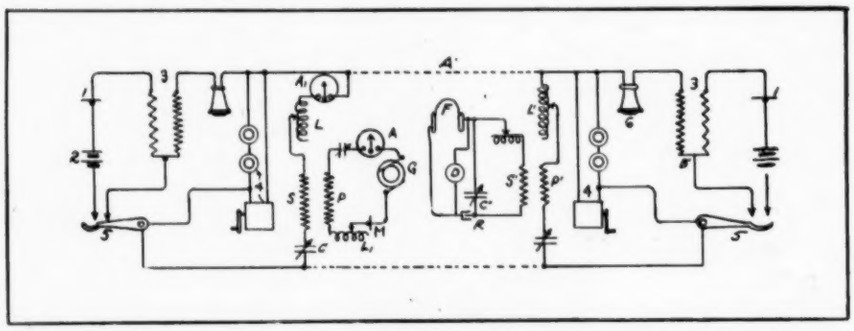


Fig. 2. Superimposing a Radio Frequency Transmitter and Receiver on Standard Local Battery Line with Receiver and Transmitter Bridged Across Line.

little was done toward the development of "line radio" or "wired wireless" for some time before and during the recent war, but, since that time, a number of papers have appeared in the scientific press, recording the achievements of various Signal Corps engineers, particularly R. D. Duncan, Jr. References are made in the foot notes to this paper to all the articles mentioned herein.

The original idea conceived by General Squier, in 1909, was simple enough: The ether waves set up by the transmitter were simply to be guided by the wires. Tuned circuits for reception and transmission were employed, as stated, and so various channels, each employing different wave lengths, could be received, each on its own tuned circuit. Two of General Squier's original diagrams, contained in his paper of 1911, are reproduced and show that his fundamental idea is really the basis of even the more highly engineered schemes of carrier current telephony at present in practical use.

In Fig. 1, we see the application of the principle of superimposing a radio frequency transmitter and receiver on a standard local battery telephone line, in which case the radio apparatus was tied to one of the lines forming the telephone pair, the other side of the radio apparatus in each case being grounded. Fig. 2 shows a similar arrangement except that both the radio transmitter and receiver are bridged across the two lines instead of being grounded as in Fig. 1.

In both diagrams, there is shown this fundamental essential—that there shall be placed on the line an oscillating high-frequency current known as the "carrier," supplied, in the particular case mentioned, by the high-frequency alternator G tied to a tuned circuit including a microphone, which, in Fig 1, was placed in series with the high-frequency generator and the tuning elements—C' variable condenser, and P, an inductance. Coupled with this was another tunable circuit consisting of a variable air condenser, C, loading inductance, L, and inductance S or secondary inductance, in coupling relation to the primary inductance, P. This inductance, S, had its lower end grounded.

The generator circuit G, condenser C', and inductance P, having been tuned to a frequency within the frequency range of the high-frequency generator, was coupled to the secondary circuit, C, L, S and P, which was connected to the telephone line over which the high-frequency current was to be sent. The ammeter, A, indicated when the secondary and primary circuits were in tune, resonance between these two circuits being indicated by the maximum reading of the needle.

The primary or generator circuit in this case was modulated by microphone M, in this way varying the steady current set up on the line by generator G. So there were set up the two desirable features for the production of modulated high-frequency carrier waves capable of translation into audible speech.

Modulation.

Telephony is accomplished by altering the amplitude of the high-frequency wave in accordance with the speech wave, at the transmitting end, and, at the receiving end, the wave is rectified by some type of detector, so that its varying amplitude is reproduced as a speech wave. If very high carrier frequencies are employed, one distinct advantage which results from their use is the elimination of the speech distortion so common to long distance wire telephony.

In accordance with radio telephonic theory, three frequencies will be present in the telephone line if the modulating frequency contains no harmonics—respectively, the main carrier frequency and the sum and difference of the main carrier frequency and the modulating frequency. If harmonics are present in the modulating frequency, then, in addition to the three main frequencies, there will be additional frequencies corresponding to the sums and differences of the main frequency and each of the harmonics.

Assuming that the fundamental frequency of the voice is 800 cycles per second and the limiting harmonic is 2,000 cycles per second, it is readily seen that, at a high carrier frequency, the band of frequencies which is transmitted is so small a percentage of the main carrier frequency, that the attenuation to all frequencies within the band is practically the same. The elimination of speech distortion, due to this cause, thus automatically results. On the contrary, if we employ a carrier wave with a frequency of 10,000, we shall have all frequencies from 8,000 to 12,000, and the tuning of the transmitter, if sharp, will cause very unequal treatment and consequent distortion of the speech at the receiving end.

Hence, sharp tuning with long carrier waves or low frequencies is impracticable and recourse has to be made to "filters," to separate the various channels when, for extremely long distances, we employ the lower frequencies to avoid very high attenuation. In actual practice, the frequencies employed in multiplex telephony over the long lines are of the order of 10,000, 15,000, 20,000 and 25,000 cycles and, with such low frequencies or long wave lengths, elaborate "filter" circuits, such as those devised by J. A. Campbell of the Western Electric Co. or

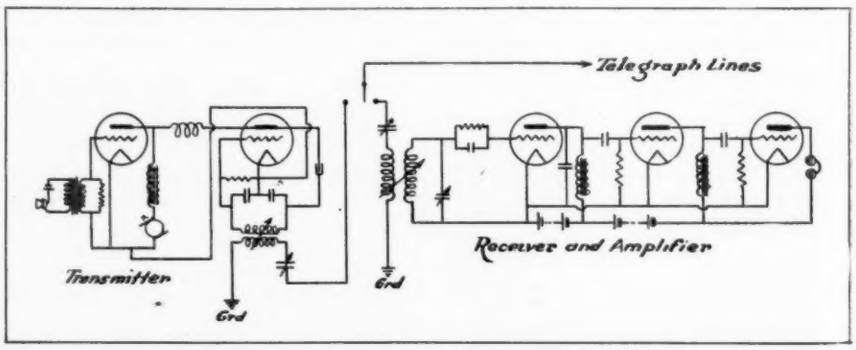


Fig. 3. Circuit Used in Experiments with Line Radio Over Telegraph Line Between Washington and Baltimore.

K. W. Wagner, of Germany, must be used.

Unless the distances to be covered are such that extremely long wave lengths or low frequencies must be used, the necessity for the filter circuits disappears and we are free to resort to the

original system using short waves according to General Squier's original method. We shall now direct our attention to some modern circuits employed by the Signal Corps, in which short waves are employed to cover considerable distances, and in which no "filter" circuits are employed.

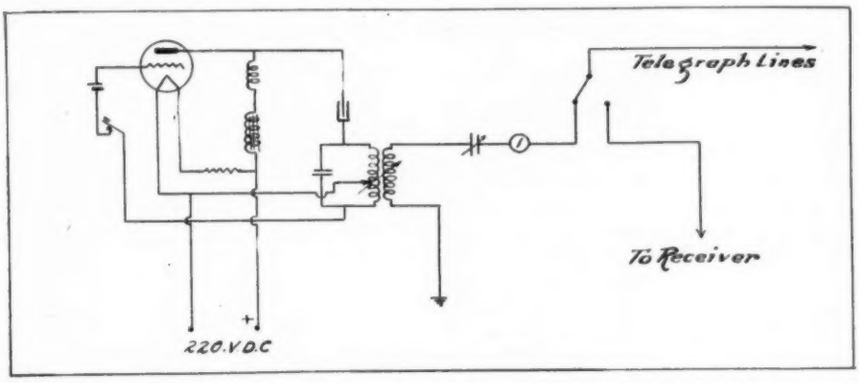


Fig. 4. Experimental Line Radio Circuit for Telegraph Purposes Only, Using a Vacuum Tube Operated from 220-Volt Direct Current Lighting Circuit.

In the early part of 1919, experiments were conducted by the Signal Corps on a wire belonging to the Postal Telegraph Co., running between Washington and Baltimore, a distance of 66 wire miles. The line was aerial throughout the distance of transmission, and contained a single section of overhead cable approximately ¼th of a mile in length. In the experiments, the transmitting and receiving apparatus was connected between the line and the ground. The circuit diagram is shown in Fig. 3. The carrier frequency employed was 600,000 cycles per second, corresponding to 500 meters in wave length.

Throughout the entire tests, the telegraph line was in ordinary duplex telegraph operation. No interference from the ordinary telegraph operation or from the "wired wireless" was experienced by either system. The normal range of the apparatus, known to the Signal Corps as radio telephone set, SCR-67-A, when functioning as a radio telephone, on an ordinary antennae, in comunication with similar apparatus, is ten miles; hence, it is seen that by means of wired radio, the range of communication with the same transmitter was increased many times.

For telegraph purposes only, a vacuum tube was employed for operation from a 220-volt, direct-current lighting source. A diagram of the apparatus is shown in Fig. 4.

Results of these preliminary experiments were of unusual interest, as it was demonstrated that transmission over relatively great distances could be accomplished with frequencies greatly in excess of the value which had heretofore positively been considered as the upper limit. It is to be noted that, in adjustment of both the transmitting and receiving apparatus, the lines were tuned to resonance by means of a series line capacity. The tuning, while not as sharp as that obtained with a radio antenna, revealed a distinct resonance point and could be made broad or sharp at will by altering the magnitude of the loading or coupling inductance.

Later experiments conducted by the Signal Corps, over the lines of the New York Central Railroad, commenced in the latter part of 1919, developed many other valuable features which have been recorded in the paper by R. D. Duncan, Jr., "Recent Attainments in Wired Radio," referred to in the foot notes to this paper. In this case, telephonic and telegraphic communication was established over a pair of wires from Elmsford, N. Y., just north of New York City, to Albany, N. Y., a distance of 130 miles.

A good quality of speech and both continuous wave and buzzer modulated telegraph signals were obtained. The carrier frequency varied from 600,000 to 300,000 cycles per second (wave length 500 to 1000 meters.) The high-frequency power output varied from less than ½ watt to 20 watts, depending upon the apparatus used. The receiver employed a detector and two stages of audio frequency amplification.

In the Washington-Baltimore experiments, as well as in the later experiments of the Signal Corps, evidence of the existence of standing waves on the telephone lines was obtained. Standing waves, as is well known, are produced by reflection from either the far end of the line or from intermediate points where there occurs a sudden transition in the electrical properties such as produced by the introduction of short lengths of cable or changes in the size of the conductor.

In the latter case, unless the reflection is complete, a portion only of the outgoing wave will be turned back and a portion will proceed unreflected. As a result, there will occur partial reflected and partial unreflected transmission.

The location of the receiving apparatus with respect to the transmitter, when standing waves are present, is, therefore, determined largely by the wave length or frequency of the carrier wave, since, for efficient reception it is necessary to avoid both voltage and current nodes. It was found that altering the frequency at the generator terminal apparently did not produce an effect in moving the nodes and loops along the lines equivalent to that of moving the receiving apparatus.

In the preliminary experiments previously mentioned and in the earlier New York Central tests, one overhead wire with a ground return was employed. A comparison of this arrangement with an all-metallic circuit showed that the latter was the much superior of the two, both as to volume of speech received and the elimination of external disturbances such as that produced by nearby radio stations. The reason for this improvement is attributable to the pronounced energy-radiating and absorbing properties possessed by the one elevated wire with ground return.

The question of cross-talk was investigated, as it was believed that at the high frequencies, inter-line disturbances might be prohibitive of utilizing the same carrier frequency on more than one line or pair of lines on the same pole. In the Washington-Baltimore tests, it was found that it was possible to receive signals with the lead wire to the receiving apparatus disconnected from the line in question and held in the immediate vicinity of the same or wrapped around, but not making contact therewith. Signals of reduced intensity, also, were received with a lead wire connected to other immediately adjacent lines on the same cross arm.

Complete elimination of cross-talk to other lines, however, was obtained when the first few miles of conductor adjacent to the transmitting apparatus ran through underground cable. When employing an entire metallic circuit, at the very highest frequencies used, there was a complete absence of cross-talk to the other conductor pairs on the same pole.

The problem of multiplexing the lines has been given some study by the Signal Corps, but no definite data is available for presentation at this time. The construction of the various carrier frequencies to be used in multiplexing is roughly determined by the condition that each band of wave lengths needed for transmission shall be 5,000 cycles in width and that these bands shall not overlap; but the problem is more complicated than this mere statement would imply, since the matter of harmonics and other points also, must be considered in the selection of waves for multiplex working.

It is evident that for successful operation, wired wireless telephone systems must be capable of being worked in either direction without switching. This is made possible by using a different carrier fre-

(*Please Turn to Page* 28)

The Gathering of State Executives

Officers of State Telephone Associations Hold Luncheon and Interesting Meeting in Chicago—Fifteen States Represented—Rural Rates, Inductive Interference, Public Relations and Illinois Resolutions Are Discussed

One of the most fruitful conferences held in connection with the national telephone convention in Chicago last week was the luncheon and meeting of the officers of the state telephone associations, which was scheduled for Friday afternoon, October 27.

Fifteen different states were represented, either by the president or secretary of its telephone organization. At one o'clock the luncheon began in Parlor L, Hotel Sherman, and when adjournment was taken three hours later, all agreed that they had profited greatly by the interchange of ideas pertaining to the better development of the business.

Those present were: Minnesota—President Jay Greaves, Vice-President D. W. Gretorex, Secretary-Treasurer J. C. Crowley, H. F. Lueders and D. M. Neill. Missouri—Secretary R. W. Hedrick and H. C. Todd. Ohio—President Frank L. Beam, Secretary Frank L. McKinney and Frank A. Knapp. Indiana—Secretary F. O. Cuppy, Treasurer M. F. Hosea, Vice-President Sam Tomlinson. Kansas—President T. L. Youmans, Secretary L. M Kraege, J. A. Gustafson and C. C. Raymond. Pennsylvania—President H. F. Bradley and E. D. Schade.

Illinois—Secretary Jay G. Mitchell, H. H. Knipe, E. D. Glandon and A. R. Bone. Nebraska — Secretary - Treasurer R. E. Mattison. Florida—President W. G. Brorein, New York—Vice-President and General Manager J. G. Ihmsen. South Dakota —President J. A. Steninger. Oklahoma—President J. W. Walton. Texas—Secretary L. S. Gardner. California—C. A. Rolfe. Iowa—Secretary C. C. Deering and H. L. Beyer.

President F. B. MacKinnon of the national association presided, with Charles C. Deering acting as secretary.

Status of Inductive Interference.

The chair requested Mr. Deering to inform the meeting about any recent developments on the subject of inductive interference. The secretary read phrases from the statute passed by South Dakota which, in his opinion, gives telephone companies satisfactory protection from injury by power lines.

Reference was also made to the court decision in Washington which was in favor of a power company and to the disadvantage of the telephone interests. But, the speaker said, the prospects are that the case will be reopened and an opportunity given for a more favorable adjudication of the case.

D. M. Neill remarked that while he was in South Dakota recently he had occasion to give some attention to the law in operation there, and he is of the opinion that it gives ample protection to telephone operating companies.

Rural Subscribers and Increased Rates.

On invitation of the chair, Secretary Crowley of the Minnesota association related some experiences concerning troubles with farm subscribers over increased rates. He cited several instances in which operating companies were made the victims of dissatisfied rural patrons, and told of the difficulties in getting any satisfactory settlement of the controversies.

Max F. Hosea, of Indiana, followed and gave testimony as to the working out of similar disputes in his state. He urged the necessity of a telephone man presenting a determined front in dealing with disgruntled subscribers, and declared that where the manager had backbone, he usually won out. He said that over 200 cases of this nature had come under his observation and the result was satisfactory to the telephone company whenever a determined stand was taken.

The importance of having friendly public relations was pointed out but, over and above everything else, the speaker emphasized the need of the telephone company being resolute in standing up for its rights.

C. A. Rolfe, of California, declared that there were too many "pussy-footers" in the telephone business, meaning thereby managers who were trying to get along on a rate that was economically too low. He said that rates all over California were much higher than in the East, and he expressed surprise that companies in the Middle West could get along at their present rate of compensation.

He urged the education of the public and said that any community, when given the facts, would be willing to pay an adequate rate for good telephone service.

Secretary Kraege of the Kansas association related an interesting account of a case that came under his observation in which disgruntled subscribers sought to force a local company to operate at an impossibly low rate. The manager in question stood pat, held on to his toll lines, and within a few months was vindicated by the opposition surrendering and meeting his terms.

Good Service—Proper Public Relations.

Mr. Kraege said that the important considerations were to have proper publicity, good service and a manager who was on the job, cultivating good relations and protecting the property. Mr. Kraege's remarks were given close attention and were generously applauded.

Secretary Hedrick of the Missouri association suggested that the telephone company which seeks an advance in rates would do well to invite the mayor, aldermen and other local authorities in to inspect its books and verify the need for more revenue. He said that rebellion against telephone rates was usually led by some individual who could be pacified if dealt with diplomatically.

Sam Tomlinson, of Indiana, took issue with this proposition and related a personal experience in which he was unable to obtain the consideration of the local leaders with whom he had consulted before making application for increased rates. His idea is to make a determined fight and stand up for his rights, which, he believes, would usually result in vindication.

President J. W. Walton, of Oklahoma, told the meeting how he prepared to make his rate fight which included getting the support of the business men who sensibly went on record as being willing to pay a fair price for good service.

President Greaves, of Minnesota, in his remarks endorsed the action of the convention in retaining its Independent form of organization and gave arguments for better co-operation between the state and national associations.

Illinois Resolution Explained.

H. H. Knipe informed the meeting as to the origin of the Illinois resolutions and said they were not meant to injure the national association, but merely contemplated better co-operation with the Bell connecting companies.

He was followed by Secretary Mitchell of the Illinois association who spoke in the same vein. Mr. Mitchell said that Illinois had found it advantageous to co-operate with the Bell as a member of the state organization and believed that good results would come if that co-operation were extended as provided by the Illinois resolutions. As the national association had voted to take a contrary view, however, the Illinois association bore no ill feeling and would continue to co-operate with the national organization as much as possible.

President MacKinnon spoke in acknowledgment of these statements from Illinois and coincided with the view that there should be complete co-operation between state associations and the national body.

A. R. Bone, commercial superintendent of the Illinois Bell Telephone Co., who is a director of the Illinois Telephone Association, was called upon for remarks, and told the conference how much his company appreciated its connection with the

Independent organization of the state. He said he found it most agreeable and productive of good results to work in harmony with the Illinois Independent companies and hoped that such co-operation would continue. The meeting then adjourned.

Conference of Wisconsin Association November 9 and 10.

There will be a meeting of all the members of the Wisconsin Telephone Association in Madison November 9 and 10. The purpose of the meeting is to discuss and take such action as may be advisable on the reports of committees now working on the following subjects:

1. Recommendations respecting the new safety code.
2. A set of standard rules of operating for local exchange traffic.
3. Federal regulation of depreciation reserve.
4. Recommendations of the committee on inductive interference.

As these are matters of importance to all companies, a large attendance is expected at the meeting.

The request has been made that companies having cases of inductive interference report to F. H. Runkel, Portage Telephone Co., Portage, Wis., so that the committee in charge of this subject may be able to work out a practical solution for the protection of telephone companies.

The new safety code, the notice of the meeting states, imposes heavy responsibilities on telephone companies in providing protection for employes, and for this reason it is desired to have the managers take part in a discussion of the recommendations of the committee.

Members planning to attend the conference should notify the association at once and specify the hotel reservations desired.

New York's Latest Meeting

Two-Day Session of Up-State Telephone Association of New York at Syracuse Brings Out Many Practical Ideas Regarding Exchange and Plant Operation—Co-operation and Harmony Stressed by Bell Official

A readiness on the part of everyone in the Up-State Telephone Association of New York to get behind association activities and push them to success has made the district meetings of that state famous. The one held at Syracuse, October 17 and 18, came well up to the standard in the benefits which it gave to those attending.

The first session was called to order at 10 a. m. by Chairman H. P. McDonough, president and general manager of the Wayne Telephone Co., Newark, who introduced Mayor J. H. Walrath of Syracuse. The mayor extended the telephone men a hearty welcome to the city, spoke a few words on the importance of the telephone in the affairs of today, and gave the floor to George R. Fuller, of Rochester, president of the association.

Mr. Fuller, after accepting on behalf of the association members the mayor's invitation to make themselves at home in Syracuse, stressed the benefits to be gained by attending district conferences and complimented those who have had charge of the arrangements for previous meetings as well as Mr. McDonough and Mr. Cox, who had charge of the one at Syracuse.

He remarked that each meeting has been a little better attended than the one before and interpreted this as a sign of increasing interest in what the association is doing.

J. G. Ihmsen, of Albany, general manager of the association, is enthusiastic over the progress of the association and takes every opportunity to spread its gospel. As usual, he delved into the things it has accomplished and the work it has outlined for the future.

He recalled to those present the fact that their watchword is "co-operation" and impressed upon them the necessity of working with the officers of the association, the member companies, public officials and the public, with a view of bringing about harmonious telephone conditions.

The chairman presented a plan which the plant employes of the Wayne Telephone Co., of Newark, have been following to utilize the rainy days. On a recent visit of the officials through the Wayne company's territory, one of them happened to look under one of the bins and he noticed a pile of wire of various lengths, and the same thing was seen in the corners.

Upon inquiry he found that all the No. 12 N. B. S. copper wire is saved, annealed and on rainy days the time is employed cutting it into lengths for tie wires. They make their own ground rods—at least, they buy the ground rods and attach the copper wires and solder them, thereby saving 10 cents on each rod. Another economy is using No. 17 twisted pair wire again by splicing and soldering it, so that there is no waste.

W. S. Vivian, of Chicago, presented a convincing group of facts to the telephone men on "The Value of the Operators' Conference." The saving in time by standardizing the methods of operating, and the success with which the principles have been received and applied, were so forcibly brought out by Mr. Vivian that practically every manager who heard him resolved to send as many operators as he could spare to the next conference.

The first session closed with a few remarks from A. D. Welch, of New York City, general commercial superintendent of the New York Telephone Co.

E. R. Stonaker, of the Mountain Home Telephone Co., Plattsburg, repeated a paper, "Measuring the Traffic Job," which he had presented at the Jamestown meeting. It received many favorable comments at the Syracuse meeting also.

Gordon Harris, director of the Wayne company, read a paper on "The Country and the Demands for Progress," which fitted in well with the balance of the program.

A talk on "Harmony" was given by T. P. Sylvan, vice-president of the New York Telephone Co. He expressed satisfaction that the day has passed in which many of the telephone fraternity were actuated solely with the desire to build up systems, which in many cases had to be at the expense of a competitor.

Mr. Sylvan stated that while in many lines of industry competition is the life of trade and the stimulus needed to make for progress, it is not so with the telephone industry. Rather, co-operation and working together for the advancement of all, are the things necessary.

The acceptance by the public of the fact that good telephone service will not brook of division, he declared, puts a greater burden on the industry, for no matter how fair the company may be, there is always a lurking suspicion that whatever the company does is done because it has the power.

"Our progress," said Mr. Sylvan, "must come from within and that can only come when separate and distinctive units—forming part of the whole—free to function, to experiment and to think, can vie with each other and with only one slogan—who can best serve the public and win their confidence and best give them an exchange service at the lowest possible rate.

"There should be a tremendous bond of sympathy between the telephone operators in the state of New York, for we all have the same problems—they are identical in every way. There is not a company, from the smallest to the largest, but has got to take care of the expense of new money for extension and development. There is not a company that does not have the necessity of establishing a proper rate

structure and of establishing and maintaining proper public relations. Size constitutes practically the only difference.

"Now we can bind ourselves together as a telephone fraternity, each determined that insofar as it lies in his power he shall not accept praise of himself at the expense of his brothers in other parts of the territory. This upbuilding of strong local companies, each standing on its own feet and capable of doing its own work, will make for the biggest progress in the telephone business.

"We have, of course, passed the era of competition fireworks and hurrahs, and business has got down to a long, steady grind, but that makes the accomplishment all the more glorious—the fact that the fireworks are not here, that you have to go slowly and win public favor.

"To continue in the telephone business in the present requires inspiration. You have got to feel that you are really doing something more than taking care of the company—that you are serving the community and conserving the peace and happiness of our country. The telephone fraternity take pride in the fact that they are engaged in an occupation that means the linking together of town and country, city with smaller cities, state with state, and now we have passed the bounds of national borders—we have tied the island of Cuba tight by a bond that will never be separated.

"The strength of the association depends entirely on that it is not a one-man association; it is made up of many units, each an important part, and each part contributing to the welfare of the whole. That must be maintained.

"No one man, no group of men, can possibly carry the load in the future days insofar as the development of the telephone art goes. It must be divided."

He advocated that all of the companies attack the problem of establishing a local credit that would permit of their doing their own financing, rather than to go to some city bank or organization for financial help when it is needed. That is one of the means of making proper and permanent public relations, he said.

Others who spoke at the meeting were Mr. Rogers, of the New York Public Service Commission, and L. E. Williams, of Syracuse, division commercial representative of the New York Telephone Co., on "Commercial Service Bureau Work and Its Direct Application."

The subject of collections was discussed by F. A. Burger, of Newark, auditor of the Wayne Telephone Co.; W. R. Adams, of Albany, division commercial manager of the New York Telephone Co.; Mr. Fluhrer, president of the Otsego & Delaware Co., Oneonta, and various other association members.

John P. Boylan, of the Rochester Telephone Corp., Rochester, N. Y., delivered a paper on "Public Relations Begin at Home"; W. C. Sexsmith, district commercial manager of the New York Telephone Co. at Binghamton, spoke on "Connecting Company Relations"; Mrs. E. E. Lewis, of Cuba, N. Y., discussed "Service Company Management"; and C. C. Green, of the Glen Telephone Co., offered some remedies for small companies touching upon various plant, traffic, commercial and accounting matters.

An operators' conference, under the direction of W. S. Vivian, of Chicago, was held in connection with the meeting and was voted a tremendous success.

NOT ONLY——

By Miss Anne Barnes,

Traveling Chief Operator, Iowa Independent Telephone Association, Des Moines, Iowa

Not only the tall corn grows in Iowa—but *everything* worth while. It is of one of these worth while things that I want to tell you.

While I was in Nevada, Iowa, recently, I was invited one evening to attend a meeting of the operators of the Story County Telephone Co. in their rest-rooms. These meetings, I was informed, were held every two weeks; they were for educational as well as social purposes. The program was prepared and directed by a committee of two operators—one arranged the program and conducted the lesson; the other took charge of the menu and the serving of light refreshments.

The first number was a lesson from the long distance text book. The operator in charge of the instruction gave each one a numbered question. When she called for a number the operator holding the question with the corresponding number read the question and it was then open for discussion. Everyone entered into the spirit of the occasion and many valuable points were discussed.

At the close of the lesson, sides were chosen and a spell-down code contest followed. The winning side was given a small prize.

There were other good numbers on the program but I will mention only one—a paper prepared and read by an operator.

I would like to add that the Nevada operators took quite an active part on the programs of the schools conducted by the Iowa State College last spring. If they prepare as many good papers between now and the opening of the spring schools, we can expect a splendid program at Nevada.

The five operators at Montezuma, Iowa, took a written test of 106 questions on their long distance tributary instruction. They all passed the test with high grades.

Florida Company Comes to the Fore with Rapid Strides.

The Leesburg Telephone Co., of Leesburg, Fla., is rapidly taking its place as one of the larger telephone companies of the state. The placing of all its lines in Leesburg underground recently is its latest accomplishment and the next will be the change from magneto to common battery. The company has received much favorable comment in the newspapers because of these two improvements.

Otto Wettstein owns the Leesburg Telephone Co. and W. F. Girtman, who has had many years of experience with the Bell and other companies, is the superintendent. To Mr. Girtman the populace gives a large share of the credit for the better service conditions.

Other improvements lately completed were the installing of new exchanges in Umatilla, Taraves and Mount Dora and bringing the service in those towns up to standard.

New Land Wireless Telephone System in Japan.

Application for government sanction to establish a wireless telephone system has been made by the Daido Electric Power Co., of Nagoya, Japan, according to advices received by the U. S. Department of Commerce. The company proposes to operate this wireless system primarily for its own convenience in connecting the various stations with its electric light and power system, but its use may be extended eventually to the general public if sufficient demand should arise.

As at present planned, the wireless system will start from Okuwa in Nagano Prefecture on the Central Japan Railway line, from which point communication will be established through Nagoya and as far as Osaka, a distance of about 150 miles.

Pennsylvania Convention Scheduled for Middle of January.

The annual convention of the Pennsylvania Telephone & Traffic Association will be held in Harrisburg at the Penn-Harris Hotel, January 11, 12 and 13, 1923, according to a recent announcement.

Plans are already under way for making this a memorable meeting.

The Line Operator at a Toll Center

Important Responsibilities and Duties of a Line Operator at a Toll Center, Which Are Common to All Offices, Large and Small—Paper Presented at Operators' Conference of Illinois Telephone Association at Peoria

By Miss Catherine Sullivan
Chief Operator, Illinois Bell Telephone Co., Peoria

The responsibilities and duties of a line operator at a toll center are many and varied. Some are comparatively simple, while others are more complex. I shall not attempt to cover all of the various phases of a line operator's work, for this obviously would be beyond the scope of this paper. However, there are certain important responsibilities and duties which are common to all offices, large and small, and which should receive careful thought, in order to have the work of a toll center handled promptly, courteously and with a minimum of waste of valuable operators' time and circuit time.

A line operator's responsibilities can naturally be grouped under three main divisions:

(a) Responsibilities and duties to the subscriber.

(b) Responsibilities and duties to other operators.

(c) Responsibilities and duties to the telephone company.

I have mentioned these responsibilities in this order, not because they rank in importance in the order given—for all of them are equally important—but because they are more easily discussed in this way. Under each of these main divisions of responsibilities, I will first mention some of the more important ones and later attempt to show how each of these responsibilities are met in the various steps necessary to complete a long distance call.

Consider first our subscriber, in relation to the line operator's work. It is by no means a small part that the line operator plays. She is primarily responsible to the subscriber for courteous, prompt and accurate service.

Of these, courtesy ranks very high, for no matter how prompt or accurate the service may be, if it is accompanied by a discourteous act on the part of the line operator, our subscriber is very apt to feel that the service we are rendering is not up to the high standard we are striving for. A line operator must always remember that she is *the* telephone company, in all of her dealings with her subscriber.

Courtesy smoothes out difficulties, creates good feelings, and encourages the use of the service by the public. It is what everyone has a right to expect from another, and is particularly important in telephonic communication where impressions are conveyed by means of speech.

It is, of course, easy to say that the line operator is responsible to her subscriber for prompt service. Under normal conditions of facilities a line operator can largely control the speed of service being rendered. If her work is properly organized, a fairly uniform and prompt service is assured.

I like to think of a line operator as being the "general manager" of the position she occupies while performing her work. One of the important factors having a bearing on the speed of service rendered is the "position management" on the part of the line operator. What do we mean by this term "position management"? It is a whole lot similar to the conduct of a general merchandising business, where, for example, we find managers of retail stores.

You have all at one time or another gone on a shopping tour, visiting several different stores. And, undoubtedly, you will have noticed in some stores, when you ask to be shown a particular article, the salesman informs you that he thinks he has the article you desire.

He then disappears and after looking in about sixteen show-case compartments, not to mention the numerous shelves and other nooks and corners, he finally finds an article similar to that for which you are looking, but it is more or less shop worn. Of course, you decide you can do better elsewhere, and you enter the store across the street. You are greeted with a smile, and upon making your wishes known, the salesman immediately produces for you the desired article, and you notice that it is not the least bit shop worn.

You would call the first store poorly managed; nothing is in the proper place, the service is slow, and the merchandise is not up to the standard you have a right to expect. Now it is possible for an operator to manage her position poorly. If this is the case, you will usually find completed tickets, tickets in the process of completion, tickets being talked on, call order tickets, report tickets, scratch pads, pencils, etc., scattered over the face of the board in disorderly fashion. It never is possible to locate the right ticket at the right time.

Calls are completed in a haphazard way and no attempt is made to give the proper precedence to calls with respect to their filing time, with the result that the line operator wastes her own effort, wastes circuit time. Above all, she is not fair to her subscribers, for, under these conditions, she may be giving three-minute service to some subscriber, while another one may have to wait 20 or 25 minutes for his call to the same point.

Picture, on the other hand, a position occupied by a line operator who, by experience, has learned the advantages of proper position management. On the bulletin holder you will find one outward ticket on which the operator is working and also call order tickets written at this particular office at the request of another toll center operator on account of the called number not answering or being busy.

At this operator's position you will notice a ticket clip on the face of the board directly in front of the operator, under which new business, yet to be worked on, is filed in the order in which it should be completed, the earliest filed call being on top. In a spiral ticket holder located near the calculagraph you will find all tickets which are being timed during conversation, arranged in the same relative order as the pairs of cords used.

In a pack on the keyboard, face up, in the order of their precedence, with the earliest on top, are placed all delayed tickets, which are due to be tried within approximately 15 minutes. All other delayed tickets will be found in a ticket compartment marked, "Awaiting Completion." You will also note three other ticket compartments marked, "Completed," "Canceled" and "Supply," in which are filed respectively, the completed, canceled and blank tickets.

The operator at this position has her work well organized. She knows where to find her work, knows the relative stage of completion of all of her calls, and furthermore keeps it moving with the minimum of effort on her part. And by doing this she knows that almost auto-

THE TASK OF THE HOUR.

The world has not yet recovered from the deep hurt inflicted upon it by the war. That recovery will be slow, weary, tedious, and there will be many setbacks. The supreme task of statesmanship at this hour is the pacification of nations so that the people shall have leisure to devote themselves to the peaceful avocations of life, to fill up the depleted reservoirs from which we all draw.—Lloyd George.

matically she will render a prompt and uniform speed of service over each circuit group.

A line operator above all must be accurate in everything she does. Consider the important feature of timing a long distance call. We surely do not want to overtime a connection and hence overcharge a subscriber for the service rendered. However, it is just as important that we do not undertime a connection. It is almost universally true that a subscriber will pay for the service if a connection runs into overtime, provided the service has been prompt and courteous.

If we charge a subscriber for only three minutes' conversation when he himself knows that he has talked six minutes, he will very likely form the opinion that the telephone company is very lax in everything it does, and this, we all know, is never the case.

A line operator, then, must be thoroughly familiar with the rules of timing, conversations and, above all, her work must be so organized that accurate results can be obtained with a minimum of effort. Here again, position management plays an important part as it makes it easier to do the right thing accurately at the right time.

Line Operator and Other Operators.

Consider next a line operator's duties, and responsibilities to other operators. It is obvious, that if service is to be given accurately, quickly and economically, all of the employes who may be required to participate in the establishment of a long distance connection must work in complete harmony and with full understanding of their respective duties and responsibilities. To accomplish this purpose, instructions for toll operating employes, which have been found by experience to render the most satisfactory service to the company's patrons and to secure the most efficient use of the company's plant have been developed.

Today we find these instructions almost universally adopted by all companies, for they realize that for long distance service to be truly universal in nature, operating practices must be the same in Canton, Peoria, New York, San Francisco and Havana, Cuba. It, then, is one of the line operator's first responsibilities to be thoroughly familiar with these instructions and carry them out in all of her work.

In the application of these instructions it is of the utmost importance that a pleasant tone of voice and a courteous manner be exercised in dealing with another employe, friendly, courteous coöperation with operators in her own office and other offices, should be the watchword of every line operator, for this alone will smooth out the many difficulties, create good feeling, and make her work a source of pleasure.

When we consider a line operator's duties to her company, we find that she is responsible for conducting her work in such a way as to insure the least waste of her own efforts, of switchboard equipment, and of toll circuit time. And furthermore, she must complete as much of the offered business as possible. The time that the toll circuits are used in attempting to complete calls should be kept as short as possible consistent with accuracy and thoroughness. Similarly, the time that a line operator works on a call should be kept at the minimum consistent with the proper effort to complete the call without making another attempt.

Elimination of Lost Motion.

In order to enable an operator to make the best use of her time and to give the fastest service possible, it is essential that she make as few motions as possible in handling the equipment and that she perform certain steps in the completion of the call as overlapping operations.

In connection with the handling of the equipment, there are certain general principles which it is helpful to remember:

First, the line operator should learn to use her hands independently when it is desirable to do two things at the same time; for example, to remove a plug from a jack and to operate a key.

Second, toll circuits and trunks situated directly in front of the operator may be conveniently taken up with either hand, but those to the right should be taken up with the right hand, and those to the left with the left hand. This may make it necessary for the operator to transfer a plug, which she is holding, from one hand to the other.

Third, it is usually unnecessary for the line operator to drop a plug which she is holding in her left hand, in order to cut into a call circuit or to operate a key, as she can perform these simple movements with one finger.

In addition to these principles, there are many steps in the completion of a call which may be performed at the same time some other work is being done, or in other words performed as overlapping operations, of which the following are examples:

Overlapping Operations.

1. Locating an out or in ticket upon receipt of a report ticket.
2. Disposing of completed tickets.
3. Examining tickets covering delayed calls, to ascertain when the second route may be used, when a subscriber's line should be released, or when subsequent attempts should be made.
4. Writing on tickets.
5. Attaching tiger clips on built-up circuit connections.
6. Securing rates and routes.
7. Securing the trunk assignment and taking up the subscriber's line on the next call to be worked on as soon as the line operator has rung the calling station on the call being worked on, to give a report which will probably dispose of the first call.
8. Becoming acquainted with the details of the next call to be handled.
9. Proceeding to quote the charge or to give a report and at the same time ringing on the toll circuit to pass a clearance order.
10. Stamping off tickets at end of conversation and disconnecting on previous direct circuit connections.
11. Stamping off tickets at end of conversation, ringing, cutting-in, and passing verbal clearance on previous built-up circuit connections.

If a line operator follows the methods of overlapping suggested, she not only saves her own time and efforts but also saves on the amount of outward toll positions it is necessary to provide to handle the toll business.

One big factor, for which a line operator alone is responsible, is the use she makes of toll circuits. It should be her constant effort to reduce the non-productive operating use of circuits and to increase the amount of conversation time for which subscribers are charged.

One of the chief ways a line operator can save circuit time is to work on only *one* call, over *one* circuit at *one* time. It is not at all unusual to see a line operator working over two or more circuits at one time. The argument advanced in defense of this method is that she can keep the business moving faster in this way.

Methods of Saving Circuit Time.

However, our experience has shown us that the *one* circuit at *one* time method moves the business just as fast, if not faster, and does it with considerably less circuit time. Besides this, there are a number of little ways of saving circuit time, each of which may save only a few seconds, but all together they make a considerable difference in the total time a circuit is used. Some of these ways are:

1. Before working out on a toll circuit, the line operator should always secure the calling subscriber's line. This is to guard against the possibility of finding the calling line busy when she is ready to establish the connection which would cause waste of circuit time and annoyance to the called party.
2. A line operator should never take up a toll circuit until she is ready to go ahead with the call. When the circuit is taken, the operator should ring as soon as the plug is completely inserted in the jack. This is easy to do if she has her finger on the ringing key, ready to ring while taking up the circuit.
3. When the distant operator answers, she should pass the number promptly. She should speak distinctly, neither too rapidly nor too slowly, so that the distant operator will at once hear the number correctly. A confused or hesitating way of passing a call may result in errors by the distant operator and a great deal of oper-

tors' and circuit time may be lost before the error is corrected.

4. After passing the called number, the line operator should listen carefully for the repetition by the distant operator and check the number repeated with the number on the ticket. If an error has been made, it is important that it is detected right at this point, to prevent annoyance to the party who would be called in error, delay to the line operator's work, and wasted time on the toll circuits.

5. When the called station answers, the proper announcement of the call prevents a waste of toll circuit time. The name of the line operator's office should be spoken just as distinctly as possible, so that the call will be recognized at once as a long distance call. Remember that as a rule the person answering the telephone does not expect to be addressed by an operator in a distant city, and unless her first words are said in a way to secure his undivided attention, time may be wasted by having to repeat the announcement. A line operator should also be careful to pronounce the name of the called party distinctly, for unless she makes herself understood she may establish the connection with the wrong person, with the resultant annoyance to both subscribers and also a big waste of circuit time.

6. As soon as the line operator learns that the called party is there and ready to talk, she should waste no time in ringing the calling station while requesting the called party to hold the line.

7. After a connection has been made and the calling and called parties are talking satisfactorily, the line operator should, of course, go ahead with other calls; however, she should keep this connection in mind. When the disconnect signal appears, she should stamp the ticket and release the toll circuit as quickly as possible, doing this as on overlapping operation if she is working on another connection at the time.

8. Next to working on more than *one* circuit at *one* time, the improper clearance of built-up circuits probably causes as much circuit waste as any one other single factor. A circuit is not properly cleared unless the line operator who originally built up the circuit, has passed a clearance order to the first intermediate operator, giving her the name of the terminating office.

In all cases, an acknowledgment of the clearance order must be received from the first intermediate operator, by the line operator, or otherwise the circuit is not properly cleared. It is very important that the first intermediate operator be given the name of the terminating office, so that she in turn may properly clear that portion of the circuit which is built up beyond her office. To aid in the proper clearance of circuits, it is advisable for the line operator to have some means of readily distinguishing a built-up circuit connection. A tiger clip fastened to the toll cord is used as a reminder of a built-up circuit connection which must be properly cleared at the end of conversation.

When a subscriber files a long distance call for a telephone or person in a distant city, he has just one purpose in mind,

IF YOU WANT IT.

To want anything, from the hairs on your head to your toenails, with every pulse of your blood and every breath of your spirit, to want it waking or dreaming, year in and year out, to burn up in it your family, your clothes, your food, your reputation, and then to leap soul-foremost into the furnace yourself—when anyone wants like that, let lesser men make way."—Dr. Frank Crane.

and that is to obtain telephone communication. If a report of delay is given to him by the operator, it is simply an explanation of why we are unable to deliver, at the time, the service which he has ordered. Such a report is in no sense a substitute for communication, although at times it may be all that we are able to furnish.

From the company's standpoint, it is the line operator's job to complete calls. A telephone company is not in business for the purpose of giving information as to the whereabouts of various persons, or to report on the condition of the plant, any more than a railroad is in business to post notices to explain why trains are not running or delayed. The railroad's business is to transport passengers and freight, and the telephone company's business is to establish telephone connections between persons in different cities; anything less than that is unsatisfactory to the public and to the company alike.

To attain the greatest measure of success in completing calls, accuracy first of all is required. Accuracy means following closely the operating practices. Every step which is prescribed has a bearing on the prompt and satisfactory completion of the call and it is important that no step be omitted, for such an omission might delay or risk the completion of the call. The general steps in advancing a call toward its completion are comparatively simple and may be listed as follows:

1. Before taking up the toll circuit:

(a) Make sure that all the items on the toll ticket can be read, particularly the telephone number and the name of the called party.

(b) Secure the calling line.

(c) Determine the proper route to be used and in all cases avoid unauthorized routes.

2. After ringing on the toll circuit:

(a) Remain cut-in until an answer is obtained or the circuit is found out of order.

(b) Pass the call or order to the distant operator promptly and check the acknowledgment.

(c) Remain cut-in on the circuit until the called station answers or a report is received.

3. After having reached the called station:

(a) Announce the call promptly and clearly to the person answering the telephone. Include in the announcement any information appearing on the ticket which may be of assistance in identifying the called party.

(b) Ask the necessary questions, if the called party is not immediately available, in a thorough effort to complete the call on the attempt being made at that time. Translate the report of delay into code, if possible, and record it on the ticket.

(c) Pass the report promptly to the calling party, and follow further instructions thoroughly so that the call may be completed, if possible, without making another attempt.

(d) Establish the connection quickly if the called party is reached, or, if the desired person cannot be reached, suggest to the calling party that we will complete the connection to an alternate party if he so desires.

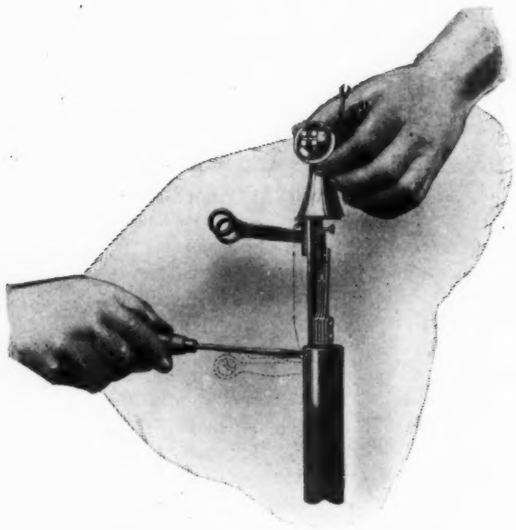
In addition to accuracy, alertness has an important bearing on the successful completion of calls. In some cases the person answering the called or calling station will give the line operator exactly the information she needs to complete the call, but many times she will have to assume leadership in obtaining information and will have to think and act quickly in order to get the desired results.

Sometimes in spite of the fact that all efforts to complete the call have not yet been exhausted, the calling party, upon receipt of delay, will order the call canceled. It may be that he does not understand that we are willing to take any further action necessary to complete the call.

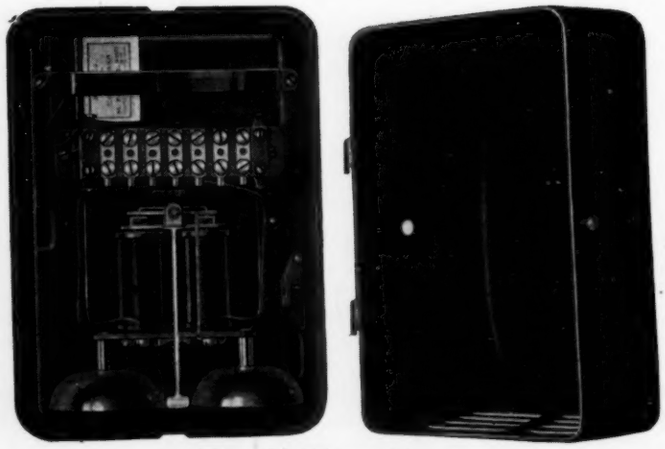
For this reason, if the nature of the report indicates a possibility of completing the call at a later time or the next day, the line operator should suggest that this be done. If this is agreeable to the subscriber, it then becomes one of the important duties of the line operator to very carefully follow up such calls on which delayed reports have been given, and which are still active. The proper subsequent attempts on such calls goes a long way towards securing a fine completion record.

I have discussed so far some of the more important responsibilities of a line operator, to her subscribers, to other operators and to her company. It might be of interest to take one complete unit of a line operator's work, the completion of one call, and analyze how, in each indi-

Type 21 Desk Stand



All Parts Are Easy of Access



Type 21 Ringer Box

Write for illustrated circulars giving complete detail specifications of both wall and desk telephones.

The Desk Telephone You Have Been Waiting to See

For automatic or manual use; furnished with or without automatic dials, or "blanked" for dials for present manual and future automatic operation.

The Type 21 Desk Instrument Has Every Approved Feature of Existing Designs, and Many That Are Entirely New. Here Are Some of Them:

Offset Standard—On this new instrument the standard is set back from the center, improving the appearance of the telephone and affording protection to the dial when the set is used for Automatic operation.

Improved Transmitter Mounting—The transmitter shell is fastened to the solid aluminum bronze mounting neck by a hinge having the appearance of a ball and socket joint, but permitting vertical movement only. The hinge is concealed in the transmitter cup and is accessible by removing the transmitter. The transmitter may easily be moved but is held positively in any desired position.

Weight and Balance—The weight and balance of the desk set is such that it will not move on the desk when dialing.

Bakelite Parts—In both wall and desk sets, the transmitter mouthpiece and the receiver shell and cap are constructed of bakelite.

Accessibility of Parts—By removing the base plate which is held firmly by a single screw, and loosening the screw above the hook, the entire hook and spring assembly may be lifted about four inches. See illustration. The connecting cable is formed to allow for this. Every part is exposed to view and easily accessible for adjustment or replacement. The base is clean and neat, containing only the terminal block, connecting cable, and dial.

Interchangeable Parts—The transmitter assembly, hook and spring assembly, and calling dial on the desk stand, and the base and interior assembly of the ringer box are interchangeable with those parts for the Type 21-W Wall Telephone.

Ringer Box—The base and interior assembly of the ringer box is identical with that of the Type 21 Wall Set. The ringers are enclosed, and all parts compactly assembled, but easy of access. The terminals of both desk stand and ringer box are designed to permit any possible circuit combination to be used without change in interior wiring.

Write for prices and further information.
Immediate delivery.

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ASSOCIATED COMPANIES:

INTERNATIONAL TELEPHONE SALES AND ENGINEERING CORPORATION, New York

International Automatic Telephone Company, Ltd., London	Compagnie Francaise pour l'Exploitation des Procédés Thomson-Houston, Paris.	Automatic Telephone Mfg. Co., Ltd., Liverpool	Automatic Telephones, Australasia, Ltd., Sydney

vidual step necessary toward the completion of such a call, the line operator meets her responsibilities.

Assume, if you will, that the call has been accurately recorded and all necessary details secured, that all directory and routing work has been performed, and that all work at the line position has been systematically arranged as suggested under position management. This will mean that all calls, orders and reports are arranged in the order of their precedence.

1. The first thing a line operator does in completing a call is to secure the subscriber's line before working out on the toll circuit. By doing this she avoids the possibility of unnecessarily annoying the called subscriber should the calling line be found busy when she is about to complete the connection, and she also avoids the possibility of considerable loss of circuit time.

2. She next selects an idle circuit of the proper grade and rings as soon as the plug is completely inserted in the jack. By taking up the toll circuit only at the time she is ready to work out on it, and immediatley ringing properly, she again saves a few seconds of valuable circuit time.

3. After ringing, she remains cut-in on the toll circuit until an answer is obtained. While waiting for this answer, she saves a little time by recording on the ticket the trunk number and her personal number.

By remaining cut-in on the circuit, she saves her own time, the time of the operator at the distant point and also circuit time, for if she did not remain cut-in on the connection, it would be perfectly possible for the distant operator to answer in the interval that the toll line was not guarded. The inward operator at the distant end would not in all probability be in on the connection when the line operaor comes back, and another ring becomes necessary, causing additional work for both operators as well as loss of circuit time.

4. When the distant operator answers, she passes the call or order promptly and distinctly, thus avoiding repetition with its consequent loss of time. She also enters the passed time on the ticket as an overlapping operation.

5. She carefully checks the acknowledgment by the distant operator with the number shown on the ticket. Failure to do this, she knows, may result in a wrong number being connected, with the resultant annoyance to a subscriber of being unnecessarily called, and which may incur the waste of her own time, the distant operator's time and considerable waste of circuit time.

6. She remains cut-in on the circuit until the called station answers or a report is received. Failure to do this may annoy the subscriber being called, for he may answer the telephone when no one is on the line. A second ring may then be necessary, causing additional work for the line operator as well as the distant operator, and resulting in a further waste of circuit time.

7. After having reached the called station, the line operator announces the call promptly and distinctly to the person answering. She knows that a hasty and indistinct announcement will, in a great majority of cases, make it necessary to announce the call a second time, with the consequent irritation of the subscriber, the waste of her won efforts and the loss of circuit time. At this stage she asks such questions as are necessary, if the called party is not immediately available, in a thorough effort to complete the call on that attempt.

It is right at this point that she, by tactful and courteous questions, can create the impression that she is honestly trying to serve the subscriber to the best of her ability. And, of course, such impressions are going to help her in obtaining information, which will result in completion of a higher percentage of the business offered. She gives the report of delay promptly to the calling party, asking the necessary questions, and follows further directions thoroughly, to the end that the call may be completed, if possible, before it is necessary to release the toll circuit.

By doing this she saves herself a lot of unnecessary work later on, and she also again saves some of that valuable circuit time. Here again, she displays to the calling subscriber an earnest desire to serve him. She very carefully avoids being the least bit discourteous, for this might create the impression that she is not interested in giving him the service he desires, and result in the cancellation of the call. Of course, loss of revenue, loss of circuit time and unsatisfactory subscriber's service are the direct results. If the called party is reached, she establishes the connection as quickly as possible, for she knows there is nothing quite so annoying to telephone subscribers as to be kept waiting at a telephone. A long wait is also wasteful of circuit time.

8. She supervises the start of conversation, and if there is the least bit of hesitancy on the part of the calling or called parties in starting conversation, she assists them, in order to prevent waste of circuit time. At exactly that time when anyone at either station speaks to and receives a response of any nature from anyone at the other station, she stamps the ticket to indicate the start of conversation.

9. She now goes ahead with other work; however, she keeps this connection in mind. When the disconnect signal appears she stamps the ticket and releases or clears the circuit, as soon as possible, doing this in most cases as an overlapping operation. She is very careful to stamp the ticket and release or clear the circuit at almost the same time, for this assures her that no circuit time will be wasted and that the length of conversation will have been timed accurately.

To meet all of these responsibilities to the best of her ability should be the constant effort of all line operators, to the end that her subscribers may be really served by her company which she represents, and that her company's interests may best be served and protected. And with it all will come the satisfaction of knowing that a big job has been well done.

New High Power Radio Broadcasting Station in Habana.

Owing to lack of adequate broadcasting facilities, radio developments in Cuba have not kept pace with the progress of radio transmission in the United States, says Assistant Trade Commissioner Livengood, Habana, in a report to the U. S. Department of Commerce. Recently a high-power sending center has been established in the capital and the market for small receiving sets is expected to widen rapidly.

This station has not yet made arrangements to supply broadcasting service, but it will do so soon. The apparatus of the company operating this station, which has a capacity of 500 watts, is an exact duplicate of that used by the New York Telephone Co. in its Walker Street station. Test messages from the new Habana station have been heard as far away as Princeton, N. J.

As in all tropical countries, Cuban enthusiasts have met with difficulty because of "static" disturbances. In spite of all obstacles, however, a considerable number of Cuban amateurs have been experimenting in receiving messages and one or two in transmission. In order to receive from United States stations, apparatus of the more expensive kind is necessary. With such sets messages have been received from Memphis, Detroit, Pittsburgh, Jacksonville, Wichita, Kansas City and Schenectady. Messages from Atlanta have been most successfully received in Havana.

Florida Company Cuts Over Its Third Automatic Exchange.

The Peninsular Telephone Co., of Tampa, Fla., cut over an additional automatic exchange of 500 lines at Clearwater on October 26. This makes the third automatic exchange of that company and its patrons report a deep satisfaction with this class of service.

Uruguay Passes Favorable Radio Legislation.

Recent modifications of the rigid laws governing the installation of wireless telephone and telegraph stations have made possible the installation of radio broadcasting, according to U. S. Vice Consul Edwin B. Montgomery, of Montevideo.

Jolly Session "Way Down in Indiana"

Southern Indiana Telephone Men Gather at Washington, Ind., for Rousing Two-Day Meeting at Which Important Matters Were Dealt With—Accounting and Public Relations Among Subjects Receiving Earnest Attention

The convention of the Southern Indiana Telephone Association was held in the Meredith Hotel, Washington, Ind., October 17 and 18. R. C. Mathews, manager of the Indiana Bell at Washington, had charge of the arrangements for the meeting and entertainment. The registration booth was in charge of the operators.

The banquet, which was held on the first day, was attended by over 100 guests representing the telephone industry in the southern part of the state. Carl Wilde, director of service of the Indiana Public Service Commission, delivered a very good address at the banquet and one which was much appreciated by his audience. It will be published in an early issue of TELEPHONY.

A group of very much alive entertainers provided a program that was received with keen enjoyment. Several readings and musical selections were furnished by the Rotary Club. Arthur Nehf, who aided the Giants in winning the world's series this year, was also on the list of entertainers. After the banquet the guests attended a dance at the Elks' club room, with Isom Ackerman and the Rotary Club as hosts.

The convention proper began at 10 o'clock the next morning in the city hall, with S. M. Isom, president of the association, in the chair. Mayor John W. McCardy welcomed the association to Washington and put everybody in a happy spirit with his ready supply of funny stories and interesting remarks. Max F. Hosea, treasurer of the Indiana Telephone Association, responded to Mayor McCardy's greeting.

President Henry A. Barnhart, of the Indiana association, was on the program for an address, but was unable to attend on account of illness.

A. E. Smith, general commercial superintendent of the Indiana Bell, at Indianapolis, spoke on the subject, "How, When and Where." He reviewed in an interesting manner the history of the telephone business from its beginning to the present hour.

A talk that was listened to with close attention was that given by Harry Boggs, chief accountant of the Indiana commission, on "Simplified Accounting for C and D Companies." Mr. Boggs explained in detail his new forms for the smaller companies and stated that all small companies in the state will be called upon to make reports in accordance with those instructions unless they are already keeping their books in a satisfactory manner.

Mr. Boggs declared that while many companies in the state are not following the uniform accounting set out by the commission, they have installed various accounting systems which are quite satisfactory to the commission. However, it will be necessary for those companies to keep on file the information that is required by law.

The new forms will be sent out to the smaller companies in about a month, the commission's accountant said, and full instructions will be given as to how to install and maintain them. He stated that it is a simplified system and any small company can easily comply with it.

Taking for his subject, "Connecting Company Relations," D. H. Whitham, general contract agent of the Indiana Bell, declared that co-operation between companies is imperative for many things, but especially for giving good long distance service. He approved of meetings such as that at Washington as being very beneficial to the telephone business in giving the managers an opportunity to become better acquainted and to learn the difficulties with which the fellow at the other end of the line has to contend.

At the conclusion of Mr. Whitham's remarks, the meeting took up the question of the date and place of the next convention. Upon invitation of the Evansville chamber of commerce and George Hall, commercial superintendent of the Indiana Bell at Evansville, that city was decided upon. The dates selected for that meeting are February 20 and 21, and the hotel will be decided upon later.

The Social Side Is Not Neglected at Meetings of Telephone Men and Women in Indiana. This Photograph Was Taken at the Recent Meeting of the Southern Indiana Telephone Association at Washington.

Telephone Short Course at Purdue, November 13-December 8.

The fourth annual telephone short course will be held at Purdue University, Lafayette, Ind., from November 13 to December 8, under auspices of the engineering extension department.

The work offered the telephone men of the state is entirely practical, and the program has been so planned that the visitor may take the particular part which interests him without staying through the entire time of the course. The work has been divided into four sections, one week being devoted to each section. The program is as follows:

First week, "The Substation Instrument"; second week, "Switchboards and Switchboard Circuits"; third week, "Cable Work, Splicing and Wiping"; fourth week, "Testing and Trouble Location."

Arrangements have been made to add some new equipment for demonstrating the operation of the latest types of common battery switchboard circuits with automatic features. It is hoped that a number of men from Indiana exchanges where this type of equipment has been installed will take advantage of the opportunity to obtain some special instruction as to the operation of these circuits.

No charge is made for the course. The only expenses are traveling, board and lodging, and personal.

A pocket set of tools should be brought, and those desiring to do so may also bring Wheatstone bridges or any similar apparatus for testing.

For further details address Professor R. V. Achatz, department of electrical engineering, Purdue University, Lafayette, Ind.

"Wired Wireless"—Line Radio

quency in each direction or by using the same frequency and a bridge arrangement. The latter is a much more difficult method, but allows of more channels. A discussion of this arrangement cannot be entered into at this time, but can be found

(Continued from page 17.)

generator and balancing network arrangements employed by the American Telephone & Telegraph Co. in this country, but time will not permit of the introduction of this matter. A careful study of

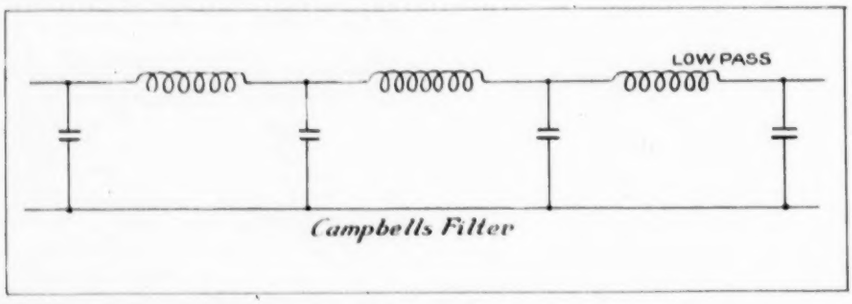

Fig. 5. "Filter" Chain Which Will Pass Low-Frequency Currents.

in the biblography of the art referred to.

Referring again to the subject of "filters," about which much has been written, we will state briefly that the "filter" is arranged to pass a band of frequencies of a certain width. Usually this band of frequencies is 2,000 per second wide, and the "filter" must pass this band with a very small attenuation and offer a large attenuation to all frequencies outside this range. Fig. 5 shows a "filter" chain consisting of inductances and capacities, designed by Campbell, which will pass low frequency currents, and Fig. 6 one which will pass high frequency currents. Two such chains in series will give the required characteristic shown in Fig. 7.

Another arrangement, Fig. 8, is due to K. W. Wagner, which gives a curve similar to that shown in Fig. 7, and the band can be made of the correct width and for the actual frequencies desired by a suitable choice of the inductances and capacities. Still another "filter" arrangement used in this country, also, giving the desired band characteristic is shown in Fig. 9.

For a very complete exposition of the theory of these "filters," it is recommended that K. W. Wagner's article in the "Archiv fur Electrotecnick" Volume 3, 1915, be consulted.

Much might be said about the harmonic

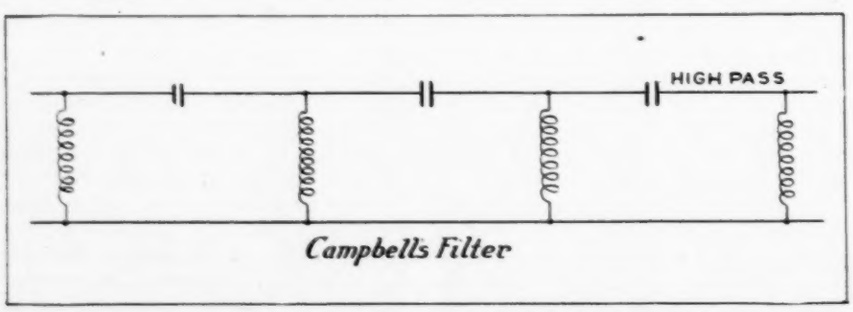

Fig. 6. "Filter" Circuit Which Will Pass High-Frequency Currents.

this can be made by those interested by consulting the paper of Colpitts and Blackwell before referred to. Likewise arrangements for transmission of wired wireless over high-tension power lines cannot be dwelt upon here, but must be found in the literature on the subject. It is believed, however, that a brief reference to the method of wired wireless broadcasting over power and light lines may well be touched upon at this time.

Some time during the months of March and April of the present year, Major General Squier made an announcement of the work which had been done in the office of the Chief Signal Officer in connection with the subject of broadcasting on light lines, upon which General Squier has applied for patents in connection with his earlier patents on the broad general subject of wired wireless.

These experiments have demonstrated that it is entirely feasible and practical to transmit high-frequency current telephony over power lines and electric light circuits, and to receive it at any point on the line. A single transmitter with an output of not over 50 watts connected to the power or lighting lines of a city at some suitable point may broadcast over a considerable area and may be received by a great number of people by connecting ordinary radio receivers at various points on the line, the connection usually being made by a suitable plug placed in any lamp socket.

The transmitters and receivers are of usual types now employed for radio telephony and may be connected to the power line in various ways; the preferred arrangement being used at present is shown in Fig. 10.

In this method of connection, the danger of short-circuiting the mains is entirely avoided—the condenser between the

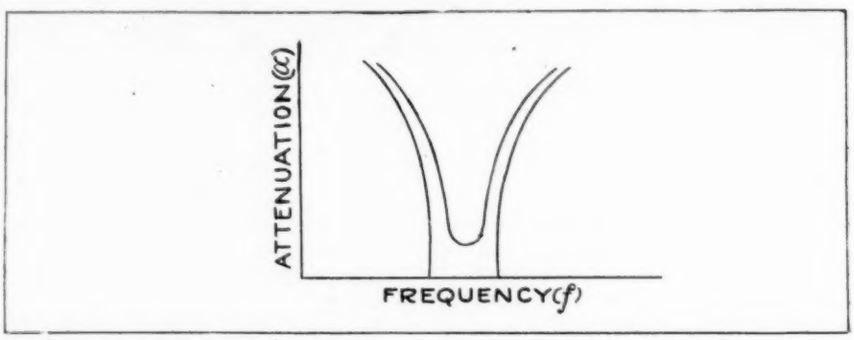

Fig. 7. Characteristic Curve from Combination of High and Low-Frequency Filters.

mains acting as a by-pass for the high-frequency currents only, but allowing the low-frequency power current to flow along the mains. For the radio currents the two mains are connected in parallel and used as one conductor, the ground being the return conductor.

It is to be noted, however, as before mentioned, that there is a tendency for the lines in this case to radiate because of the relation of the line to the ground. Hence material broadcast on electric light lines in this way, particularly if the lines pass out from underground conduit and become overhead wires, may be received by any ordinary antenna entirely disconnected from the lighting circuit.

Better results with practically no radiation from the lines are obtained by connecting the transmitters and receivers between the mains instead of to ground, the mains being suitably protected by con-

densers to keep the large power current from passing through the radio apparatus. In addition to the condensers shown in Fig. 10, the receiving set itself should have a variable air condenser in series with the tuning inductance of the primary circuit for the purpose of tuning the line.

A number of plugs to screw into the electric light socket, including in their structure condensers suitable for connecting to the light lines, are now on the market, and the one known as the "Super-Antenna" designed by Radio Engineer Duncan of the Signal Corps, is found to meet all requirements, giving both suitable protection and satisfactory results.

The use of the line radio method of broadcasting as compared with space radio broadcasting has many advantages. In the first place, the ether channels used for space radio broadcasting are limited, and even the few wave channels which are available for broadcasting can be more profitably employed for such radio activities where space radio is the only or best method of communication. By space radio is meant ordinary radio telephone transmission. Also, since there is practically no radio interference caused by broadcasting on power lines or light lines, any number of wave channels may be employed, thereby multiplying the number of stations which can be operated on the same line.

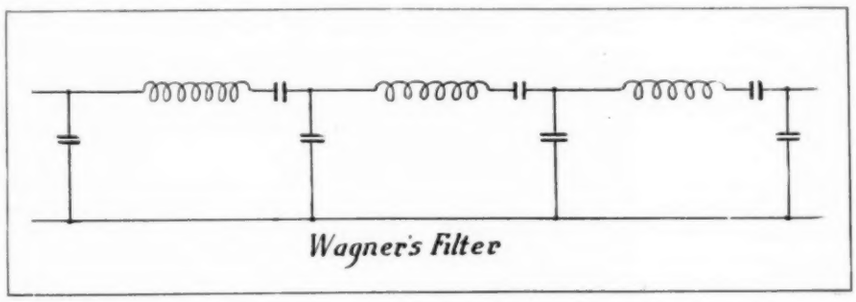

Fig. 8. Filter Arrangement of K. W. Wagner.

It is conceivable that in every community we may have several transmitting stations, operating at the same time but each on a different wave length and supplying different services. One may be used exclusively for music, another for current news, and still another for educational information. Obviously, by this means of broadcasting, no antenna is required for reception. In order that the radio broadcasting by the foregoing method may be received, a suitable plug connection in the electric light socket is all that is necessary wherever the lighting circuit exists.

During the recent experiments of the Signal Corps in connection with this wired wireless broadcasting over electric lighting lines, carried on during the month of May of the present year by a Signal Corps engineer in co-operation with the North American Co. and the Cleveland Electric Illuminating Co., very successful wired wireless broadcasting was accomplished over the lines of the latter company, in Lakewood, on the outskirts of Cleveland. A very complete account of the results obtained, together with the descriptions and diagrams of the apparatus used, can be found in the article of R. D. Duncan, Jr., "Wired Wireless Broadcasting," Electrical World, Volume 80, No. 8, Page 367, for August 19, 1922.

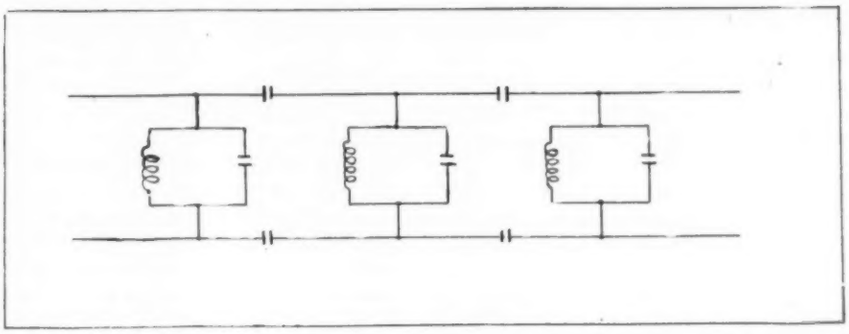

Fig. 9. Another Filter Arrangement Used in United States Which Gives the Desired Band Characetristic.

The conclusions drawn from the Washington and Cleveland experiments are that from a technical standpoint, wired wireless broadcasting over electric power lines is entirely feasible and that with the proper choice of wave lengths, the radiation from the lines may be reduced to such an extent that it will not interfere with radio communication.

Apart from the subject of actually broadcasting material over the power lines themselves, attention is invited to the fact that these lines, if connection thereto be made by the condenser plug mentioned, offer a very fine means for receiving from ordinary broadcasting stations, thereby, of course, doing away with the ordinary antenna.

Similarly, a matter which is of considerable interest to the telephone companies, is that telephone lines can be used both for wired wireless broadcasting after the manner described for light lines and with practically identical connections, as well as for the reception of signals from ordinary broadcasting stations, the lines in this case being simply used as antennae. This, of course, raises the question as to the right of telephone companies to charge for and control any and all additions or connections to their wires, which are really the property of the individual companies and not public property.

Telephone contracts should be redrawn at once in such shape, for the protection of the companies, that no piece of radio apparatus, transmitter or receiver, shall be connected to any telephone line without license from the telephone company, and then only with such connecting devices as shall have been approved and sold by the telephone company concerned. These ordinary precautions, and the sale to individuals of suitable devices for connecting to telephone lines with a numbered license, issued in every case, should give the telephone companies an additional income for the use of their lines in connection with the reception of matter broadcast either in the ordinarly way or over the lines.

It is suggested that, until further experiments are carried out by radio engi-

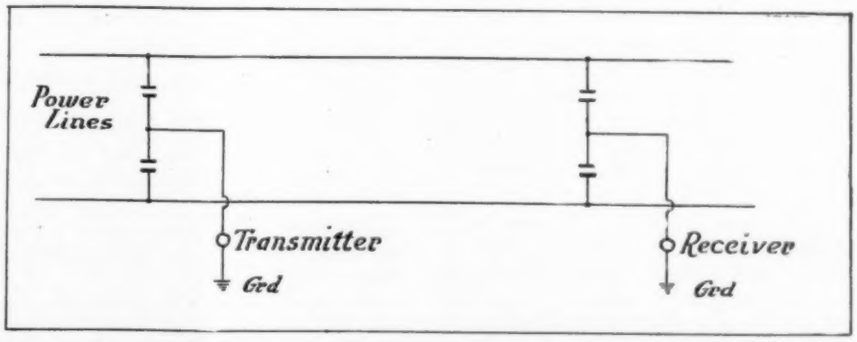

Fig. 10. Preferred Arrangement at Present Used for Connecting the Usual Types of Radio Apparatus to Power Lines.

neers, in connection with the telephone lines, no transmitter be licensed to broadcast over any telephone line, because of the confusion which may occur and possible damage to terminal and switchboard apparatus, if proper precautions are not taken.

In conclusion, I wish to state that it is my belief that telephone companies should investigate this wired wireless proposition very carefully and without delay, not only because of its possibilities for multiplex telephony, but also for the last two features mentioned, namely, the use of telephone lines for broadcasting by wired wireless, and the use of such lines as antennae for ordinary reception. I regret that more time could not be given to an exposition of this important subject, but I feel that it is one which must be carefully studied and that much experimental work must be done in connection therewith by those interested, before a clear understanding of the subject can be reached.

I have added below a brief bibliography which should be of assistance to the telephone engineer in giving a working knowledge of the art up to date. The list includes all the papers referred to in the body of this paper.

Bibliography.

1. E. H. Colpitts and C. B. Blackwell, "Carrier Current Telephony and Telegraphy," A. I. E. E. (Journal of the American Institute of Electrical Engineers) 40: pp. 301-315, April: pp. 410-421, May: pp. 517-526, June, 1921.

2. K. W. Wagner, "Electrotech. Zeitschrift" Nos. 32 and 33, 1919 (Wired Wireless).

3. K. W. Wagner (Archiv fur Elektrotechnik, 3, 1915) (Filters).

4. Major General George O. Squier, Chief Signal Officer, U. S. A. (Multiplex Telephony and Telegraphy, official United States government document, reprinted 1919).

5. K. W. Wagner, "Telegraphen u-Fernsprech Technik," No. 3, p. 29, June, 1919.

6. Faszbender and Habann, "Jahrb. d. draht. Tel. und Tel.," Band 14, p. 451, Oct. 1919.

7. Marumbo, Proceedings of the Institute of Radio Engineers, Vol. 8, No. 3, p. 199, June, 1920.

8. J. O. Mauborgne, Vol. 188, p. 91, "Journal of the Franklin Institute," 1919.

9. R. D. Duncan, Jr. "Journal of the Franklin Institute," January, 1921, p. 23.

Commissions, Courts and Councils

Discussion and Rulings of State Bodies Having Supervision Over Telephone Companies—Decisions of Courts in Matters of Interest to Public Utilities and Actions of City Councils Relative to Franchise, Rates and Service

Objects to Paying Damages for Injury to Another's Employe.

The Lincoln (Neb.) Telephone & Telegraph Co. has asked the state supreme court to relieve it from the necessity of paying $7,500 to an employe of the Lincoln Gas Company who was injured while working on a telephone company pole that the gas and electric company had taken possession of after the telephone company had abandoned it. A brief just filed in supreme court sets out the reasons why the telephone company objects vigorously to paying damages under those circumstances.

James L. Hendrix, the employe, had been sent out by the gas company manager to take its wires off the pole. While he was engaged in this work, the pole went over with him and seriously injured him, so that he cannot do a day's work any more.

The telephone company defended on the ground that the gas company was using the pole without its knowledge or consent; that the gas company had received express warning that the pole was broken, and that it in turn had expressly warned Hendrix that it was rotted at the bottom. The gas company was brought into the case by Hendrix, to whom it has been paying $15 a week workman's compensation, and it asked that from any judgment secured there be apportioned an amount equal to its payment for the accident.

Aside from a number of minor issues dealing with the facts, the case turns, so far as the telephone company is concerned, on the proposition of whether it owed any duty to the gas company's workers, and if so, had it violated it in this case? Its attorneys, Woods, Woods & Aitken, argue that before there can be any recovery because of negligence, the violation of a legal duty must first be established.

Mere permission or consent, whether express or implied from sufferance or passive acquiescence, to do a certain thing gives a license, but does not necessarily imply an invitation to do so, and hence where one company attaches its wires to another company's poles without any contractual relation or compensation but solely by permission, implied because it does not protest, there was no express invitation for the gas company to go on the pole.

If any of its employes did so, they were volunteers using it subject to all the conditions and perils, and to whom the telephone company owed no other duty than to abstain from intentionally or wantonly injuring them.

The company is relying largely for a reversal on the failure of the trial court to include, in an instruction setting out the necessary elements of an action based on negligence, the basic element whether the plaintiff has established a relation sufficient in law upon which to predicate a duty owed him by the plaintiff. Its attorneys insisted that an agreement between employes of two wire companies to use each other's poles would not imply a contract in law.

Objection was also made to the court's failure to tell the jury what it meant when it said that plaintiff's only justification for mounting the pole would be in the discharge of a public or private duty, and didn't say that the law's definition differs from the ordinary one.

Complaint is made that another instruction ignored the issue raised by the defendant and permits the jury to find that it was negligent merely from the fact that the pole was rotten, and allowed the jury to conclude the defendant was negligent without considering whether it owed any duty to the plaintiff to maintain a sound pole.

Whether or not the fact that the pole was rotten was evidence of negligence depends entirely on whether the telephone company owed that duty to the plaintiff, and the serious harm lay in the fact that the company admitted the pole was rotten and relied on the defense that it was not bound in law to supply a sound pole for the gas company's employe to mount.

Missouri Toll Line Company Authorized to Change Ownership.

An order of the Missouri Public Service Commission dated October 19 gave permission to the Polo & Richmond Telephone Co., of Richmond, to sell its lines, switchboards and other property to R. S. Mary and C. S. Swafford. The purchasers were at the same time given authority to continue to operate the system, which consists of toll lines extending between Polo and Richmond.

New York Telephone Co. Rate Case Inquiry Concluded.

Inquiry into the rates of the New York Telephone Co. was practically concluded before the New York Public Service Commission October 26, final argument in behalf of representatives of the company, of the state and the city of New York being concluded. Briefs are to be filed by all parties by November 10 with a reply brief to be made by the telephone company, if necessary, within five days from November 10.

Argument was continued before the commission all day. Frankland Briggs, representing the telephone company, dis-

cussed at considerable length the question of depreciation, while E. S. Wilson, another attorney, discussed at length the question of the New York Telephone Co.'s relations with the American Telephone & Telegraph Co. Mr. Wilson maintained that there were three things for determination by the commission before it could determine just and reasonable rates for telephone service:

1. Fixation of the value of the company's property used in the telephone service throughout the state.

2. A decision as to the proper annual depreciation charge.

3. The legality of the contract under which the New York Telephone Co. makes an annual payment of 4½ per cent of its gross revenues to the American Telephone & Telegraph Co. covering licensee agreements.

In opposition to the telephone company, there was argument by Deputy Attorney General W. W. Chambers and Assistant Corporation Counsel Fertig of New York City. Mr. Chambers argued at considerable length as to the valuation of the company's property. It was his contention that reproduction cost is not the proper way to get at the value of the company's property used in the state in forming a valuation upon which rates are to be allowed. He claimed that this valuation should be arrived at by considering the book cost of the company's property values. Various other points were discussed by Mr. Fertig.

New Rates for North Freedom Exchange of Wisconsin Company.

By its order of October 23, the Wisconsin Railroad Commission granted the schedule of rates requested by the Wisconsin Telephone Co. for its North Freedom exchange. Provision was also made in the order for eliminating free service with Reedsburg and Baraboo. The petition of subscribers at Ableman—who receive rural service from the North Freedom exchange—that the exchange be moved to that village was denied. The commission entered a supplementary order on October 25 authorizing a rural base rate of $2 a month. All the rates became effective November 1.

The evidence showed that on January 1 last the company served 272 subscribers from its North Freedom exchange and that on September 1 it served 290, an increase of 6½ per cent.

In refusing to order the removal of the exchange from North Freedom to Ableman, the commission pointed out that while the former had 66 local stations, all of which were one-party, the latter had but 34 stations and they were on party lines. It also estimated that the removal would necessitate the stringing of approximately 100 miles of wire, which would mean an excessive investment per station.

An investigation of the class of toll service furnished by the Wisconsin company showed that the complaints were unwarranted.

The annual report of the company as of December 31, 1921, gave a book value of $9,935, while an inventory as of August 1, 1921, placed the plant value at $22,832, minimum cost new, and the minimum cost new less depreciation at $17,293. The commission was of the opinion that $60 per station, or a total of $16,320, was a reasonable amount to use for rate purposes. As the rates asked for will bring a revenue less than is required on this basis, there could be no objection to them and they were accordingly allowed.

The new rates are shown below, together with those which the company has been using:

	Old rates.	New rates.
Business:		
One-party	$1.25	$3.00
Two-party	....	2.50
Extension	.60	1.00
Residence:		
One-party	1.25	2.00
Two-party	....	1.75
Extension	.50	.75
Rural:		
Within four miles of central office	1.25	....
For each mile beyond the 4-mile radius (per year)	3.00	....
Within six miles of central office	....	2.00
For each mile beyond six-mile radius (per year)	....	3.00
Switching service	.335	.625

The company was also authorized to charge 40 cents a month for each one-eighth mile of line or fraction thereof on stations located outside of premises where the main telephone is installed.

Free toll service with Baraboo and Reedsburg is to be discontinued and the company's regular toll rates substituted therefor.

An additional charge of 25 cents a month is to be made for unlimited service to Baraboo whenever a majority of the subscribers of the North Freedom exchange desire such service.

Ordered to Extend Service and Allow Connection to Line.

On October 26 the Wisconsin Railroad Commission rendered its decision in the matter of the investigation on motion of the commission of the alleged refusal of telephone service by the Rural Telephone Co., known as Line 800 out of Evansville, to McDermott Brothers, ordering the telephone line to extend its service to McDermott Bros. and to allow them to connect onto their line upon the payment of the sum of $50.

The order further provided that McDermott Bros. shall construct the line necessary to connect their premises to Line 800 of such material and with such poles as are now being used upon the line, and that the same conditions and terms of operation and maintenance of the entire system shall be complied with by McDermott Bros. as other subscribers and users of Line 800.

McDermott Bros. live in the midway territory between Evansville and Albany about one-half mile from the end of Line 800 and an equal distance from the lines of the Albany Telephone Co.

Case of Service to Radio Broadcasting Station Settled.

On October 23 the Wisconsin Railroad Commission rendered a decision dismissing the complaint of Ray S. Owen, et al., of the Kiwanis Club, of Madison, vs. the Wisconsin Telephone Co., in which complaint it was alleged that the respondent failed and refused to render service from the city Y. M. C. A. to the University of Wisconsin radio broadcasting station.

After the hearing held on June 12, 1922, negotiations were entered into between the complainant and the respondent resulting in a satisfactory settlement between the parties. Upon being advised that the service asked for is now being rendered, the commission dismissed the proceeding from the docket.

Telephone Company May Furnish Information of Removals.

In the absence of any law imposing such duty, a telephone company is under no obligation to abstain from conveying to a storage and transfer company information it may have as to persons intending to move. Its act in so doing does not infringe any rights of a competing storage and transfer company.—Gallagher Transfer & Storage Co. vs. O. K. Transfer & Storage Co.; Louisiana Supreme Court; 92 Southern, 317.

Toll Rates Specified as Soon as Lines Made Metallic.

The Wisconsin Railroad Commission, on October 27, rendered a decision authorizing the Boscobel Telephone Co., of Boscobel, and the Muscoda Telephone Co., of Muscoda, to place in effect the following toll rates:

Between Boscobel and Blue River.....5 cents per call
Between Muscoda and Blue River.....5 cents per call
Between Boscobel and Muscoda.....10 cents per call

The Boscobel Telephone Co. and the Muscoda Telephone Co. are to retain all tolls collected by them; the Blue River Telephone Co. to retain 2 cents on each message collected by it, the balance to be remitted to the company owning the line over which the message is transmitted.

The effective date of the order was November 1, provided the toll lines were full metallic at that date, or as soon thereafter as the lines have been made full metallic.

Prior to this decision, the subscribers of the Boscobel Telephone Co., the Blue River Telephone Co. and the Muscoda

Telephone Co., have had free toll service between Boscobel, Blue River and Muscoda over grounded toll lines, the Boscobel company owning and maintaining the line between Boscobel and Blue River, and the Muscoda Telephone Co. owning and maintaining the line between Blue River and Muscoda.

The companies owning these lines contended that it was now necessary to rebuild these toll lines and that in order to warrant the expense of rebuiding and maintaining them it was necessary that a toll charge be established.

Upholds Injunction Against Rate Order of Commission.

It is not error for a district court to grant a temporary injunction against an order made by the public utilities commission adjudging current telephone rates to be "just, reasonable, compensatory, and lawful," where the evidence submitted on the application for the temporary injunction tends to show that the rates are unjust and unreasonable. The rates in question did not provide an adequate return on the property, according to the valuation placed upon it by its owners.

The commission's order was made without certain evidence which the company, at the request of the commission, had agreed to furnish, and was made without notice to the company that it would be made at that time in the absence of the evidence requested.—Kansas City Long Distance Telephone Co. vs. Reed; Kansas Supreme Court; 207 Pacific, 763.

Must Offer Suitable New Franchise Before Old One Expires.

Section 3,037-d of the Kentucky Statutes makes it the duty of a city to offer for sale a suitable new franchise before the expiration of a telephone company's franchise, and deprives it of the right arbitrarily to eject the company from the streets on the expiration of the franchise. The company cannot be compelled to accept confiscatory rates as a condition for being allowed to continue its business.—City of Louisville vs. Louisville Home Telephone Co.; United States Circuit Court of Appeals; 279 Federal, 949.

May Refuse Service at Request of Police Department.

Refusal of telephone service at the request of the police department—on the ground that a charge of crime has been made in connection with the use of a telephone in the premises where it was installed, coupled with evidence that the charge was made in good faith and on probable cause—is a sufficient answer to a motion to compel the company to furnish service.

Telephone service—maintained under contract with relator's husband in his apartment house, by means of a switchboard located in a room adjacent to the main hallway and communicating with the several apartments—was discontinued at the request of the police department, following the arrest of a number of persons, including relator's husband. They were taken in the act of using the switchboard for the receipt of gambling information and were charged with a violation of section 973 of the penal laws, but were later discharged.

It was held that, on an application for peremptory mandamus to compel restoration of telephone service—where the relator, though not one of those arrested, fails to assert ignorance of the activities of those who were—the application should be denied.—Hiegel vs. New York Telephone Co.; New York Supreme Court; 195 New York Supp., 332.

Summary of Commission Rulings and Schedule of Hearings.

INTERSTATE COMMERCE COMMISSION.

October 17: Application of Wisconsin Telephone Co. for authority to acquire exchanges and property of Chippewa County Telephone Co., of Chippewa Falls, Wis.; approved.

ILLINOIS.

October 11: Cass County Telephone Co. authorized to operate a pole line near Bluff Springs in Cass County.

October 11: Order entered vacating suspension order affecting original sheets 3 and 4 of rate schedule IPUC 5, rules and regulations for service in Kewanee, of the Kewanee Home Telephone Co. These rules pertain to charges for grabaphone, reconnection of instrument after disconnection for non-payment of rental, and other charges which have been in effect since the company was established but which, through oversight, had not been filed with the commission.

October 11: Order entered permanently annuling rate schedule IPUC 2 of the Illinois Bell Telephone Co. for service in Galena, and permitting the company to file schedule IPUC 3 containing rates specified in order effective August 1, 1922.

October 24: Hearing held at Chicago on citation to Illinois Bell Telephone Co. to show why rates should not be reduced in Chicago and vicinity.

MISSOURI.

October 17: Eldon Local & Long Distance Telephone Co., of Elden, authorized to continue using rates previously allowed.

October 19: Order entered approving application of Polo & Richmond Telephone Co., of Richmond, to sell its lines and property to R. S. Mary and C. S. Swafford; purchasers also given authority to continue operating the company.

October 20: Authority given Palmyra Telephone Co., of Palmyra, to continue operations under schedule of rates allowed September 30, 1921.

October 20: Commercial Telephone Co. permitted to use schedule of advanced rates formerly allowed for its exchanges at Washington, Union, Mehlville and Beaufort.

October 21: Bevier Telephone Co., of Bevier, authorized to use rates formerly allowed and which expired November 1, 1922.

October 25: Effective date of increased rates for service by Andrew Co. Mutual Telephone Co. in Amazonia, Avenue City, Blockow, Cawood, Cosby, Fillmore, Flag Springs, Helena, Nodaway, Rea, Rochester, Rosendale and Whitesville; resuspended until April 28, 1923.

NEBRASKA.

October 25: In the matter of the protest of the Enterprise Telephone Co. against permitting the village of Ragan to construct transmission line in parallel with its lines, it being impossible to reach an agreement, matter set for hearing November 3.

October 26: In the matter of the application of the village of Henry to construct a transmission line in parallel with lines of the Platte Valley Telephone Co., ordered that permission be granted as requested with the condition that if undue interference with telephone service follows, this commission will have jurisdiction as though no permission had been granted.

October 26: In the matter of the application of the Hamilton County Farmers Telephone Association with respect to additional stock issues, ordered that the company be permitted to issue $3,000 of new stock and that its action in issuing $760 of stock without authority be validated.

NEW YORK.

October 26: Under a complaint by the Oneonta Chamber of Commerce, the commission directed an order, returnable before it on November 9, to the Ouleout Valley Telephone Co., the Otsego & Delaware County Telephone Co., and the American Telephone & Telegraph Co. to show cause why certain repairs should not be made to their lines, especially near Franklin, N. Y. It is alleged that several lines of these companies are in bad condition and that certain repairs and improvements should be made at once.

October 26: Inquiry into rates of New York Telephone Co. practically concluded, final arguments in behalf of company, of the state and of the city of New York being concluded. Briefs are to be filed by all parties by November 10 with a reply brief from the company, if necessary, within five days from November 10.

WISCONSIN.

October 23: Order entered dismissing complaint of Ray S. Owen and others of the Kiwanis Club of Madison alleging refusal of Wisconsin Telephone Co. to render service from the city Y. M. C. A. to the University of Wisconsin radio broadcasting station, cause of complaint having been satisfied.

October 26: Rural Telephone Co., known as Line 800 out of Evansville, ordered to extend its service to McDermott Bros. upon the payment of $50. McDermott Bros. ordered to construct the line.

October 27: Schedule of toll rates allowed Boscobel Telephone Co., of Boscobel, and Muscoda Telephone Co., of Muscoda.

October 23: Schedule of advance rates authorized for North Freedom exchange of Wisconsin Telephone Co.

October 25: Wisconsin Telephone Co. given permission to establish a charge of $2 per month for rural service within six miles of its North Freedom exchange and $3 per year for each mile beyond the six-mile radius.

October 30: Hearing at Madison on the application of the Sheboygan Falls Rural Telephone Co., Sheboygan Falls, for authority to increase its rates. U-2789.

October 30: Hearing at Galesville on the proposed extension by the Ettrick Telephone Co., of Ettrick, in the towns of Ettrick and Gale, Trempeleau County. T-1054.

Have Control of Kansas City Bank

Because of Important Banking Affiliations in Kansas City, A. F. Adams and H. L. Gary Retire From Active Work in U. S. Independent Ass'n—Gary Interests, Operating and Manufacturing, Represented on Association's Board of Directors

The retirement of A. F. Adams and H. L. Gary as members of the board of directors of the United States Independent Telephone Association, which took place at the annual convention held in Chicago last week, became necessary, they have stated, because of their recent important banking affiliations in Kansas City.

A syndicate composed of Theodore Gary, A. F. Adams, H. L. Gary, F. H. Woods and others, has purchased a large interest, which carries with it control, of the Commerce Trust Co. of Kansas City, Mo., Theodore Gary & Co. being managers of this syndicate.

The Commerce Trust Co. is the largest banking institution west of the Mississippi River, having deposits of approximately one hundred million dollars. The consideration in the syndicate purchase of the controlling interest in this financial institution was in excess of two and one-quarter million dollars.

Mr. Adams has been elected chairman of the board, succeeding W. T. Kemper, and becomes the ranking executive head

H. L. Gary, Due to Increasing Responsibilities Occasioned by Recent Important Banking Affiliations, Withdraws From Active Association Work.

of the institution. Walter F. McLucas, a former prominent Kansas City banker and lately vice-president of the National City Bank, New York, has been elected president, succeeding J. W. Perry. Theodore Gary has been elected a director and member of the executive committee. H. L. Gary, a director of this bank for the past several years, continues in that capacity and has been elected a member of the executive committee. H. L. Gary, for the past two years, has been a director of the Central Trust Co. of Chicago.

The retirement of Messrs. Gary and Adams from the board of directors of the United States Independent Telephone Association occasioned much regret among the members of that organization. They have been members of the board for a

A. F. Adams, Because of Duties as Chairman of the Board of Commerce Trust Co., Kansas City, Retired From Directorate of National Telephone Organization.

number of years and have, up to the last two years, always been very active in association affairs.

"The enlarging operations of Theodore Gary & Co. in the telephone field, both here and abroad, which have now been considerably expanded by their entrance into the banking field, have," Mr. Adams states, "necessitated Mr. Gary's and my retirement from the board and our withdrawal from active association work."

However, H. L. Harris of Kansas City, vice-president of Theodore Gary & Co., and also a vice-president of the several associate Gary properties, continues as a member of the board of directors of the United States association and will also take Mr. Gary's place as a member of the executive committee. Mr. Harris, as an active officer of the several Gary telephone operating and manufacturing companies, will represent the Gary companies and look after their interests in association affairs.

J. B. Earle is a vice-president and

H. L. Harris, Vice-President of Theodore Gary & Co., Succeeds H. L. Gary on Executive Committee of United States Independent Telephone Association.

director of the association and an official of telephone properties in Texas in which Theodore Gary & Co. is interested. H. D. Critchfield and W. S. Vivian are also directors, representing the Automatic Electric Co., and L. Q. Trumbull is a director, representing the Monarch Telephone Mfg. Co., both properties being a part of the Gary group.

One-Day Meet of Texas Association Is a Full Day.

Members of the Texas Independent Telephone Association of the Fort Worth district met October 18 in the Texas Hotel, Fort Worth.

As it was a one-day meet and there were many questions to be considered, J. A. Stratton, of Dallas, called the meeting to order promptly at 9:30 a. m.

George McQuaid, of Dallas, director of the Texas Public Service Information Bureau, was one of the principal speakers at the morning session. After giving figures concerning the telephone industry,

both in Texas and in the United States, he referred to the regulation of utilities and the ever-absorbing topic of rates.

"Of all the parties at interest in the subject of reasonable rates for utility service," he said, "the public's welfare depends upon the utility being able, through reasonable rates, to maintain unimpaired service and secure new capital to meet the requirements of constantly increasing demands for service.

"There is now a most compelling necessity that public utilities relieve regulatory bodies of some of the tremendous pressure falling on them through misapprehension on the part of some of the people of the economic situation. This the utilities may do by educating public opinion to the true condition of the utilities by taking the public fully into their confidence.

Particularly, the customers of a utility should be given every opportunity to understand that nothing is so expensive as poor and unreliable service and nothing so short-sighted on their part as a policy of utility starvation, either through inadequate rates or unjust burdens or irresponsible competition.

Utilities should thoroughly understand that they are public servants; that good will and public relations are to be acquired not alone by good service, but by frankness and an every-day policy of treating the smallest of their patrons with that consideration which is practiced by successful business in non-regulated fields.

There should be complete understanding that on such basic conditions as recognize the mutuality of interest of the customers and owners of the utilities and of the management of the utilities is built the policy, and the very best system known up to this time of public regulation."

Sam B. Dibble, of Dallas, equipment engineer of the Texas Telephone Co., gave a short talk on "The Proper Care of Switchboards," and pointed out several ways in which the life of expensive switchboard property can be lengthened.

"Exchange Construction and Maintenance" was discussed by S. A. Shutt, of Waco, general superintendent of the Texas Long Distance Telephone Co.

George E. Rex, vice-president of the National Lumber & Creosoting Co., Houston, discussed the results of decay in posts, the causes and remedies, and illustrated his talk with lantern slides.

The matter of "Making an Exchange Pay" was covered by O. C. Edmonds, of Pilot Point, manager of the North Texas Telephone Co.

C. A. Shock, of Sherman, general manager of the Grayson Telephone Co., talked of the "Use and Abuse of the Telephone," mentioning some of the trials of the telephone operators in handling the public.

L. S. Gardner, of Waco, secretary of the Texas Independent Telephone Association, talked on "Protection Against Unjust Legislation." He pointed out that public utilities, until recent years, have been more or less at the mercy of litigation in the courts, and many of the laws relating to liability have not been interpreted in favor of the utilities. The situation is much improved but, Mr. Gardner said, much remains to be done before the entire matter is equitably adjusted so that neither the public nor the public utilities will suffer unjustly.

Appoints Special Committee on Wood and Tubular Poles.

The American Engineering Standards Committee announces the appointment of a special committee to consider and make recommendations to the A. E. S. C. concerning the application of the American Electric Railway Association for approval as American standards of its specifications for wood poles and tubular poles.

Twenty-one men, representing producers and consumers of both types of poles, as well as the public, are on this committee. The importance of this subject to the lumber and iron industries, steam and electric railways, and other users of wood and tubular poles becomes apparent when it is known that several millions of poles are purchased each year.

It is expected that a report on the work of the committee will be made at a meeting of the executive committee of the A. E. S. C. in New York on November 9. The personnel of the special committee on poles is as follows:

E. H. Clapp (chairman), Forest Service, Washington, D. C.; C. S. Andrew, representing the Electric Railway Equipment Co., Cincinnati, Ohio; C. C. Deering, representing the United States Independent Telephone Association, Des Moines, Iowa; H. Gould, representing the Postal Telegraph-Cable Co., New York City; C. R. Harte, representing the American Electric Railway Association, New Haven, Conn.; D. F. Holtman, representing the National Lumber Manufacturers' Association, Washington, D. C.; R. F. Hosford, representing the American Telephone & Telegraph Co., department of development and research, New York City; L. L. Hill, representing the National Lumber Mfrs. Association, Minneapolis, Minn.; E. C. Keenan, representing the signal section and the telegraph and telephone section of the American Railway Association, New York City.

J. N. Kirk, representing the American Telephone & Telegraph Co., department of operation and engineering, New York City; M. G. Lloyd, chief, safety section, Bureau of Standards, Washington, D. C.; G. L. Maltby, representing the American Short Line Railroad Association, Jamestown, N. Y.; C. E. Mobius, representing the Western Union Telegraph Co., New York City; A. E. Owen, representing the electrical section of the American Railway Association, Jersey City, N. J.; C. N. Perrin, representing the National Hardwood Lumber Association, Buffalo, N. Y.; H. H. Quimby, American Society of Civil Engineers, Philadelphia, Pa.; F. N. Speller, representing the National Tube Co., Pittsburgh, Pa.; G. J. Wagner, representing the American Society for Municipal Improvements, Grand Rapids, Mich.; J. C. Ware, representing the National Electric Light Association, Newark, N. J.; Graham Bright, American Institute of Mining & Metallurgical Engineers, Pittsburgh, Pa.; and W. M. Leavitt, representing the Western Red Cedar Association, Spokane, Wash.

Heavy Screen Effectively Protects Important Telephone Toll Lead.

A rock quarry was recently opened near Rocky Point, some 16 miles north of Portland, Ore., on the Lower Columbia River Highway. The quarry is situated on the opposite side of the highway from Portland-Seattle toll lead of the Pacific Telephone & Telegraph Co., and will be a hazard to this toll lead for a period of three years or more, according to the Pacific Telephone Magazine.

Upon investigation it was found that rerouting a section of the toll lead to eliminate the hazard would entail an estimated expenditure of $6,000 and would place the lead along a less desirable route than at present. Furthermore, due to the period of time over which quarry and blasting operations are to extend, it was impracticable to place the circuits temporarily in duplex wire.

It was obvious, therefore, that some more permanent measure be adopted for protecting these important toll circuits in their present location. After an extensive study of the situation had been accomplished, it was decided to place a protective screen throughout this section.

The special screen manufactured by a Portland concern, which consisted of No. 12 BWG. BB galvanized steel wire flexibly woven into a net 10 feet wide, was selected as being adequate for the requirements. The weave of this net is such that the maximum mesh is one and one-half inches, yet when the network is loosely supported the wires separate slightly, making an effective mesh of about one inch, giving the necessary elasticity to withstand impacts from rocks thrown out during blasting.

A pole line was constructed, to support the net, a few feet higher than the pole line supporting the toll wires, to permit the adjustment of the sag in the screen to the toll wires to be protected. This pole line is offset some eight feet from the present pole line, leaving a maximum of four feet between the end of the crossarm and the net, and a minimum of two feet when the net is hit a heavy blow.

The screen is supported an 7/16th-inch strand threaded through the weaves near the top, while a 5/16th-inch strand is lashed to the bottom to prevent excessive swaying in the center of any span.

Pole after removal of decayed wood from area immediately above and below ground line.

Pole being treated with Carbosota above and below ground line.

Pole after treatment and excavation has been filled in.

Preservative Treatment for Standing Poles—

Even after untreated poles have begun to decay at the ground line, it is not always too late to derive considerable benefit from preservative treatment. For if decay has not progressed too far, corrective measures are available which pay a good profit on the small investment required.

How such a condition was met recently by a lighting company in Massachusetts, is explained by the accompanying illustrations and the quotation from "Telephone Topics."

Butt Treating for Standing Poles

"THE Gardner Electric Light Company has been treating the butts of the joint poles in Barre, the custody of which is placed with them.

"The treatment consists of excavating to a depth of two and one-half feet around the pole and removing the decayed timber by means of a long-handled chisel, after which three coats of hot grade-one liquid oil is applied.

"During the morning, the poles are excavated and shaved. In the afternoon, one man applies hot oil and one man excavates and shaves, these holes being left open until the following afternoon. The oil is heated in a pail over a torch. One coat is applied to each pole, commencing from the pole earliest excavated. The man then returns to the starting point, reheats the oil and applies a second coat and repeating the operation for the third and last coat.

"The time required for applying the first was approximately five minutes per pole. The two men are testing and treating between eight and ten poles per day within one-half mile of Barre Center. Approximately one quart of Barrett's Carbosota is used on a pole and this, according to the light company officials, prolongs the life of the pole at least six years."

Carbosota is the universal preservative for all non-pressure treatments. Its physical fitness makes it particularly suitable for uses such as that described above—where field conditions require a highly refined and specially processed liquid grade of pure coal-tar creosote oil.

The Barrett Company

New York	Chicago	Philadelphia	Boston	St. Louis
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THE BARRETT COMPANY, LIMITED:
Montreal Toronto Winnipeg Vancouver St. John, N. B. Halifax, N. S.

Barrett Carbosota For Preserving Wood

The complete net was purchased and installed, at a cost of $380 for four spans, March 5, 1922, and to date has functioned 100 per cent perfect. During this time several exceptionally heavy blasts have been put off, testing the screen thoroughly. In one instance a blast was set off that rocked everything for several miles, moved some ten yards of rock over the highway, and precipitated a maximum amount of large and small rocks against the screen.

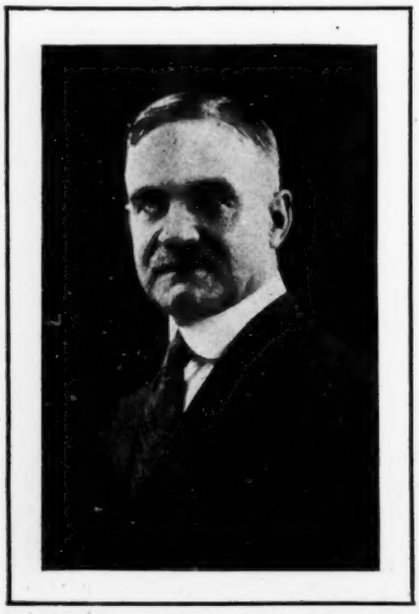
New York Company Installs 261,000 Instruments in Year.

With an installation record of 261,000 new telephones, the New York Telephone Co. has just completed a year of its greatest development, according to a recent announcement of President H. F. Thurber. During the year 118 central office switchboards have been enlarged and 11 new boards installed. It is anticipated the figures for total development during 1922 will amount to $61,000,000.

Personal and Biographical Notes

H. W. Ritterhoff, general commercial superintendent of the Kansas City Telephone Co., Kansas City, Mo., entered the telephone industry when he was a youth and has been faithful to it ever since. It was his boyhood ambition to be a telegraph operator but he found the art of telephony so absorbing that he just couldn't break away.

He was born in Alexandria, Ohio, in 1864, moved to Cincinnati with his family when he was eight years old and attended school there. When "H. W." was 13 years old his father died and the boy undertook to aid in supporting the family.



H. W. Ritterhoff, of Kansas City, Mo., General Commercial Superintendent of the Kansas City Telephone Co., Liked Telephone Work So Well When He Started as a Youngster That He Made It His Career.

He became connected with telephone work and was one of the first telephone operators in Cincinnati.

At the age of 16 Mr. Ritterhoff went to Kansas City and was one of the first operators in that city also. He grew up with the Missouri & Kansas City Telephone Co., serving it as day operator, inspector, installer, chief operator, wire chief, directory superintendent and contract agent, from 1882 to 1905.

He joined the forces of the Kansas City Home Telephone Co. in 1905 and at the time of its merger with the Bell company he was general commercial superintendent, in which capacity he remained with the new organization.

Mr. Ritterhoff has one hobby—radio. He was one of the first devotees of radio in Kansas City and has been highly interested in its development, having a radio outfit in his home. For recreation he goes to baseball games of all kinds and umpires amateur ones.

Like every good telephone man, he has ambitions for his home town. He wants to see Swope Park developed to its greatest resources and to see the civic center go up and be the showplace of the town.

J. N. Clem, who has been manager of the Indiana Bell exchange at Jeffersonville, Ind., for several years, was recently appointed manager of the New Albany exchange also. The two exchanges are being combined under a single management under the partial reorganization plan of the Bell company.

Mr. Clem will remain at Jeffersonville and will have charge of all of Floyd and Clark counties and a portion of Harrison county.

Oscar Evans, former manager of the Cumberland Telephone & Telegraph Co. in the Jackson, Tenn., territory, early in September assumed the management of the company's exchange in Memphis.

Mr. Evans was active in all efforts to promote the welfare of the city of Jackson, and served one term as president of the association of commerce.

J. J. Stephens, who has been manager of the Richmond, Mo., office of the Kansas City Long Distance Telephone Co. for the past nine months, has resigned, to go to California.

Ill health forced Mrs. Stephens to leave Missouri several months ago, and she is now located in California, where she will be joined by Mr. Stephens.

E. V. Crutcher, former manager of the New Albany exchange of the Indiana Bell Telephone Co., which will be managed in the future from the Jeffersonville office, will be transferred to an exchange in the central part of the state, according to a recent announcement.

Mayme Trierweiler Gfroerer, chief operator of the Citizens Independent Telephone Co., Terre Haute, Ind., was elected queen of Terre Haute's first Pageant of Progress Week.

She was chosen from 20 candidates by popular vote—open to all the citizens of Terre Haute and vicinity—receiving approximately 15,000 votes, some 5,000 more than her nearest opponent. The coronation took place October 31.

The six contestants who ranked next in favor with the populace acted as attendants to the queen during her reign and took part with her in the many festivities held during the week.

Everybody connected with the Citizens company—from the president to the office boy—experienced a feeling of pride in having Mrs. Gfroerer receive the honor, for, while she is well liked among the employes of the company, they didn't know that the public in general was so appreciative of the manner in which she has helped to serve it.

Mayme T. Gfroerer, of the Citizens' Company, Terre Haute, Ind. Such Is the Esteem of the Populace for This Charming Lady That They Made Her Queen of Their Recent Pageant.

Incidentally, the very attractive poster displayed in the store windows and offices of the city as a means of boosting the pageant was designed by Bert Reibel, of the company's engineering department.

Guaranteed

There's no "ifs, ands or buts" - no guesswork - about "P & H" Guaranteed Penetration Process Poles. You **know** what you're getting.

It's down in black and white in the written guarantee that goes with every shipment — "impregnated with the preservative to a uniform depth of one-half inch" throughout the ground-line area—and "the Butt-Treating price will be refunded on any pole that does not show the full specified half-inch penetration."

The "P & H" Guaranteed Penetration Process

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We can fill any pole needs—for Butt Treated and untreated Northern White and Western Red Cedar poles—or for any form of Butt-Treatment.

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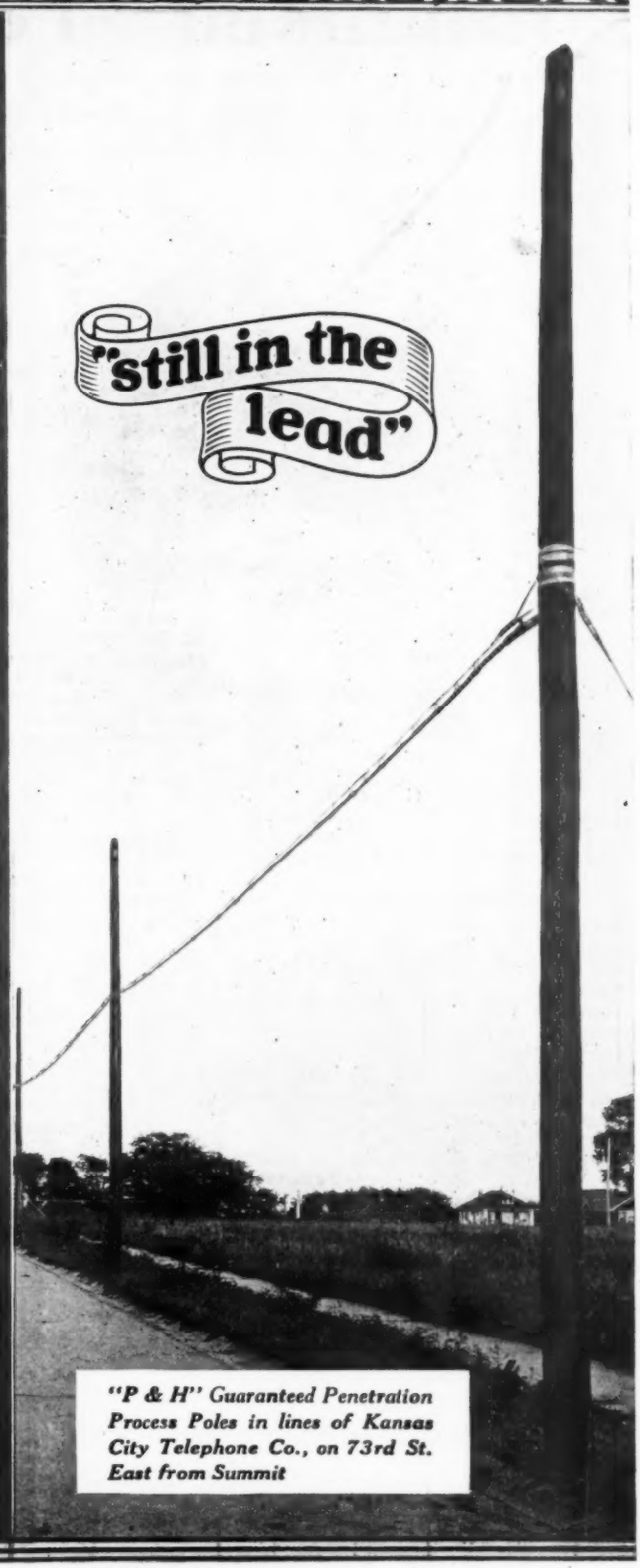

"P & H" Guaranteed Penetration Process Poles in lines of Kansas City Telephone Co., on 73rd St. East from Summit

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MAIN YARDS AND BUTT-TREATING PLANTS AT SAINT PAUL, MINNESOTA (Minnesota Transfer)

New York, N. Y. 50 Church St. Chicago, Ill., 19 So. LaSalle St. Kansas City, Mo. 717 Bryant Bldg. Omaha, Neb., 513 Electric Bldg. Houston, Texas, 1111 Carter Bldg. Dallas, Texas, 311 Sumpter Bldg. Buffalo, N. Y. 950 Ellicott Sq. Bldg Louisville, Ky. 1416 Starks Bldg.

Condensed Telephone News

Officers of Companies Are Urgently Requested to Forward to Us Promptly All Financial and Other Statements as Soon as Issued and Any Items Relating to Construction, Rebuilding, or Changes in Their Plants and Systems

New Telephone Companies and Incorporations.

PULASKI, KY.—The Verab Telephone Co. has been incorporated by A. D. Eads, Drew Bailey, C. E. Paynter, of Erod, and C. R. Burnett, of Ocala. No capital is mentioned.

WOOD TOWNSHIP, KY.—Articles of incorporation of the Star Telephone Co. have been filed in the recorder's office. The company starts with a capital of $240, and the business will be conducted in the vicinity of Starlight, Wood Township. The object of the corporation is to operate a neighborhood line. The incorporators are Theodore Rathe and George Koerber.

NEW YORK CITY, N. Y.—The Uruguayan Telephone Co. has been incorporated to do business in Uruguay and elsewhere. The capital stock is $1,000,000 and the incorporators are F. T. Porter, O. T. Bradley and L. G. Coleman, all of New York City (the Corporation Trust Co. of America).

COLOME, S. D.—The Hillcrest Telephone Co. has been incorporated with a capital stock of $5,000 by Wade Wood, of Winner; A. A. Stenson and C. H. Hatfield, of Colome.

SALEM, S. D.—D. Goldsmith, L. V. Schneider and S. M. Gilbert, all of Salem, have filed articles of incorporation for the Salem Telephone Co. The capital stock mentioned is $25,000.

Construction.

CALICO ROCK, ARK.—A new rural telephone line has been built from Calico Rock connecting with Berry and McPhearson.

JUNCTION CITY, ARK.—Work has been in progress on the rebuilding of the telephone system at this place.

BEAR VALLEY, CALIF.—The California Railroad Commission having confirmed the permit allowing the Bear Valley Utility Co. to establish a telephone exchange and long distance service in Big Bear Valley, announcement has been made that construction will start at once. It is expected to have service in operation before the end of fall.

The company will take over the Talmadge & Betterly line from Highland to Big Bear Valley and will make extensive repairs. An exchange will be installed and the long distance service will be handled through the San Bernardino office of the Pacific Telephone & Telegraph Co.

EUREKA, CALIF.—The Pacific Telephone & Telegraph Co. will reconstruct the Eureka-San Francisco lines, at a cost of $350,000.

DENVER, COLO.—The Mountain States Telephone & Telegraph Co. has set aside $193,000 to be used for improvements, among which will be a $25,000 addition to the Gallup exchange. The program will commence with that and others will follow. In addition to the outlay for extra housing, $80,000 will be spent for new cable work.

TAVERES, FLA.—The Lake County Telephone Co., of Live Oak, has purchased a lot and will erect a two-story building for its office. The company is also placing its wires in Tavares underground.

ELDORADO, ILL.—When the stockholders of the Eldorado Telephone Co. held their annual meeting a short time ago, they authorized President W. L. Ford to purchase and install an additional 165-line section to the present switchboard. This addition is made necessary by the increased demands for telephones.

SAND SPRINGS, OKLA.—More than 100 persons have applied for telephones on the new line between Sand Springs and Tulsa. According to J. Thompson, manager, 250 can be cared for on the present switchboard. It is expected that the instruments will be in use some time this month.

WOODWARD, OKLA.—The Southwestern Bell Telephone Co. is putting up some new long distance lines.

BIRCHWOOD, WIS.—The Wise Telephone Co. has announced that service will soon be extended to Angus, west of Birchwood.

Elections.

CORDOVA, ILL.—The Cordova Telephone Co. has elected Charles Quick as secretary to succeed John Mackey, who has moved to Moline.

SWEETWATER, ILL.—The officers elected recently at the annual meeting of the Sweetwater Telephone Co. are: V. C. Grant, president; Samuel Propst, vice-president; John Sampson, secretary-treasurer; A. H. Cleveland, superintendent.

GREENFIELD, IOWA—At the annual meeting of the Lincoln Mutual Telephone Co., held during October, the following officers were elected: Len Roberts, president; Charles Hoepner, vice-president; R. M. Wilson, secretary and manager; and W. R. Goodman, treasurer.

GUTTENBERG, IOWA—The new officers elected at the annual meeting of the Guttenberg-Garnavillo & Garber Farmers Telephone Co. are: Wm. Rodenberg, president; Wm. Berns, vice-president; Harry Berns, treasurer; and Werner Fassbinder, secretary. The directors for the ensuing year are: John Rodenberg, Herman Rersner and W. F. Kregel.

At the meeting it was decided to build a toll line from Garnavillo to Guttenberg, also to Garber and Osterdock.

The company was organized two years ago with 19 stockholders. At the present time it has 76 stockholders.

Miscellaneous.

NOKOMIS, ILL.—The Peoples Mutual Telephone Co. has received a new 20-year franchise from the city council.

MARINGOUIN, LA.—The Star Telephone Co. has been sold by its manager and owner, Henry Coates, to Mrs. N. B. Spencer.

LIBBY, MONT.—Completion of a deal for the sale of the Libby-Troy Telephone Co. by E. H. Cookingham and B. H. Snowden to W. B. Patterson, of Spokane, Wash., has been announced. Mr. Patterson, who has been in the telephone business for 30 years, has been employed as outside construction foreman for the Interstate Utilities Co., of Spokane.

MIDDLEBURG, N. Y.—The Middleburg Telephone Co. has acquired the ownership of the Fulton Valley Telephone Co.

PURYEAR, TENN.—The Puryear Telephone Co. changed hands recently when J. M. Coben leased the property from A. G. Jackson.

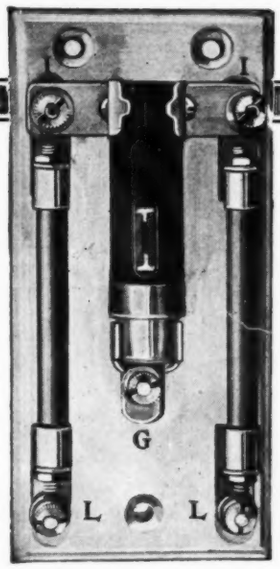
Those Present at the Convention

MISSOURI.

Conant, C. W., Monarch Telo. Mfg. Co., Kansas City.
Cox, J., Kansas City Telo. Co., Kansas City.
Crane, J. G., vice-pres. and gen. mgr., Kansas City Telo. Co., Kansas City.
Crane, J. G. Mrs., Kansas City Telo. Co., Kansas City.
Crawford, V. L., sales mgr., Everstick Anchor Co., St. Louis.
Dare, D. A., supt. and eng., Capital Telo. Co., Jefferson City.
Davis, H. E., asst. to gen. mgr., Kansas City Telo. Co., Kansas City.
Dennis, H. L., auditor, Kansas City Long Distance Telo. Co., Kansas City.
Faris, H. N., Kellogg Switchboard & Supply Co., Kansas City.

(Concluded from Last Week's Issue.)

Faulhaber, R. G., purchasing agent, Kansas City Telo. Co., Kansas City.
Faust, W., gen. plant supt., Kansas City Telo. Co., Kansas City.
Ferguson, W. E., sales mgr., Lynton T. Block Co., St. Louis.
Galloday, M. L., secy. and gen. mgr., Home Telo. Co., Holden.
Galligan, J. P., Stromberg-Carlson Telo. Mfg. Co., Kansas City.
Haftenkamp, G., Kansas City.
Haftenkamp, G. Mrs., Kansas City.
Harris, H. L., vice-pres., Kansas City Telo. Co., Kansas City.
Harrison, J., asst. gen. mgr., Kinloch Telo. System, St. Louis.
Hedrick, R. W., secy., Missouri Telo. Ass'n., Jefferson City.
Heiner, W. H., mgr., Commercial Telo. Co., Washington.
Helmholtz, K. J., mgr., French Battery & Carbon Co., Kansas City.
Holdeman, B. C., Kansas City.
Jackson, W. D., Lynton T. Block & Co., St. Louis.
Johnson, W. W., Jefferson City.
Kavannaugh, W. J., Kansas City Telo. Co., Kansas City.
Kysela, F. J., dist. mgr., National Carbon Co., Kansas City.
Larsen, C. J., engineer, Kansas City Telo. Co., Kansas City.
McHenry, H., gen. mgr., Capital Telo. Co., Jefferson City.
Matthews, C. L., vice-pres. and secy., W. N. Matthews & Bro. Inc., St. Louis.
Polk, W. C., consulting engineer, Kansas City Telo. Co., Kansas City.



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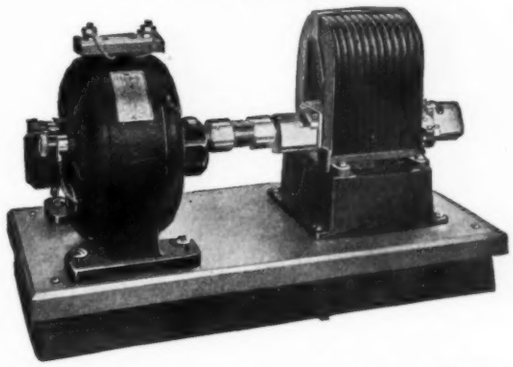
Take our new Type 440, for instance. It embodies all the advantages of BRACH Arresters—full protection against lightning, crosses, grounded lines—gives clear transmission and balance of potential between pairs.

Price complete with porcelain base, fuses and mountings —$1.50 each.

L. S. BRACH MFG. CO., Newark, N. J.

Dependable Ringing Service —With Economy!

A Holtzer-Cabot Magneto-Ringing Motor-Generator



is the ringing equipment that NEVER FAILS. It is uniformly dependable—and economical in first cost and in upkeep. It needs no costly attention—if properly lubricated.

Send for illustrated circular. Or, better still, give it a test in your exchange; we stand back of the machine.

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TELEPHONE AND TELEGRAPH WIRE

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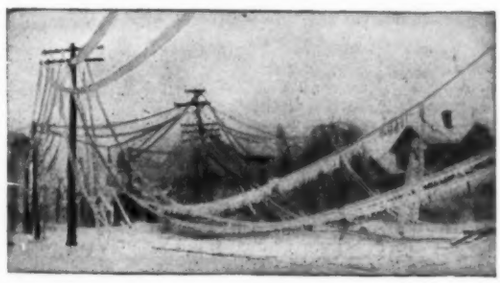
MUNCIE, INDIANA



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Randall, M. O., gen. supt., Home Telo. Co., Joplin.
Roberts, A. J., Stromberg-Carlson Telo. Mfg. Co., Kansas City.
Ritterhoff, H. W., gen. com'l supt., Kansas City Telo. Co., Kansas City.
Shands, A. J., traffic mgr., Kinloch Telo. Co., St. Louis.
Shutt, E. H., Standard Underground Cable Co., Kansas City.
Todd, H. C., vice-pres. and gen. mgr., Hanamo Telo. Co., Maryville.
Waddell, S. C., French Battery & Carbon Co., Kansas City.
White, H. C., Kellogg Switchboard & Supply Co., Kansas City.
Wilkins, J. E., Stromberg-Carlson Telo. Mfg. Co., Kansas City.
Winemiller, P., Stromberg-Carlson Telo. Mfg. Co., Kansas City.
Wopat, J. W., Kansas City Telo Co., Kansas City.
York, E. D., Stromberg-Carlson Telo. Mfg. Co., Stewartsville.

NEBRASKA.

Bell, J. M., Lincoln Telo. & Teleg. Co., York.
Bell, W. E., com'l supt., Lincoln Telo. & Teleg. Co., Lincoln.
Brewster, R. S., Lincoln Telo. & Teleg. Co., Lincoln.
Caster, M. T., plant supt., Lincoln Telo. & Teleg. Co., Lincoln.
Johnson, W. W., gen. mgr., Kearney Telo. Co., Kearney.
Le Mon, W. L., Lincoln Telo. & Teleg. Co., Lincoln.
McGregor, D. E., Kellogg, Switchboard & Supply Co., Grand Island.
Matteson, R. E., gen. mgr., Lincoln Telo. & Teleg. Co., Lincoln.
Preble, A. B., Stromberg-Carlson Telo. Mfg. Co., Kearney.
Schafer, E. P., Omaha.

NEW YORK.

Angle, W. M., secy., Stromberg-Carlson Telo. Mfg. Co., Rochester.
Barrett, J. T., Stromberg-Carlson Telo. Mfg. Co., New York City.
Buland, S. A., gen. supt., Stromberg-Carlson Telo. Mfg. Co., Rochester.
Cox, D. C., vice-pres., Friendship Telo. Co., Syracuse.
Crandall, Geo. H., Stromberg-Carlson Telo. Mfg. Co., Schenectady.
Eastwood, W. T., adv. mgr., Stromberg-Carlson Telo. Mfg. Co., Rochester.
Eidam, E. G., asst. chief eng., Stromberg-Carlson Telo. Mfg. Co., Rochester.
Fuller, Geo. R., pres. Rochester Telo. Corp., Rochester.
Hanover, E. A., Stromberg-Carlson Telo. Mfg. Co., Rochester.
Heiser, J. B., National Pipe & Cable Hanger Co., New York City.
Heyden, J., French Battery & Carbon Co., New York City.
Ihmsen, J. G., vice-pres. and gen. mgr., Up State Telo. Ass'n., Albany.
Kaiser, B. A., American Telo. & Teleg. Co., New York City.
McCanne, W. Roy, treas. and gen. mgr., Stromberg-Carlson Telo. Mfg. Co., Rochester.
Mallory, E. B., Westinghouse Elec. & Mfg. Co., New York City.
Manson, R. H., chief eng., Stromberg-Carlson Telo. Mfg. Co., Rochester.
Meyer, C. R., Electric Cable Co., New York City.
Powell, W. T., eng., Stromberg-Carlson Telo. Mfg. Co., Rochester.
Reinke, E. A., asst. sales mgr., Stromberg-Carlson Telo. Mfg. Co., Rochester.
Roworth, E. C., asst. secy., Stromberg-Carlson Telo. Mfg. Co., Rochester.
Scoville, Geo. A., sales mgr., Stromberg-Carlson Telo. Mfg. Co., Rochester.
Snyder, J. C., Stromberg-Carlson Telo. Mfg. Co., Rochester.
Tevis, J. H., eng., Stromberg-Carlson Telo. Mfg. Co., Rochester.
Weston, C. T., asst. mgr., Port Byron Telo. Co., Port Byron.
Weston, C. W., mgr., Port Byron Telo. Co., Port Byron.
Wright, J. H., vice pres. and gen. mgr., Jamestown Telo. Corp., Jamestown.

OHIO.

Allen, Harvey M., Portsmouth Telo. Co., Portsmouth.
Arter, R. C., sales mgr. and secy., North Elec. Mfg. Co., Galion.
Avery, A., pres., Avery & Loeb Elec. Co., Columbus.
Beam, Frank L., pres., Mt. Vernon Telo. Co., Mt. Vernon.
Bechdolt, F. W., Auglaize Telo. Co., Waynesfield.
Bechdolt, Mrs. F. W., Auglaize Telo. Co., Waynesfield.
Berry, A. J., secy. and mgr., Marion Co. Telo. Co., Marion.
Berry, Mrs. A., Marion.
Berry, L. M., Craven & Berry, Dayton.
Bonner, J. D., mgr., Ashtabula Telo. Co., Ashtabula.
Bonner, Mrs. J. D., Ashtabula.
Branson, John, pres., Wellington Telo. Co., Wellington.
Burgoyne, H. W., Lima Telo. & Teleg. Co., Lima.
Campbell, J. O., gen. supt., Local Telo. Co., Norway.
Carson, F. R., Twin Dry Cell Battery Co., Cleveland.
Carter, Geo. A., mgr., Citizens Telo. Co., Delaware.
Chapman, F. S., Kenton.
Cotabish, M. S., dist. mgr., National Carbon Co., Cleveland.
Covell, W. H., mgr., Bellevue Home Telo. Co., Bellevue.
Craven, Geo. R., Craven & Berry, Dayton.
Crawford, A. B., sales engr., Stromberg-Carlson Telo. Mfg. Co., Columbus.
Curren, A. J., pres. and mgr., Elyria Telo. Co., Elyria.
Davis, A. E., mgr., Delphos Home Telo. Co., Delphos.
Dewey, H. H., treas., Home Telo. Co., Clyde.
Diven, W. C., pres., Citizens Telo. Co., Delaware.
Domke, Chas., tel. engr., Buckeye Telo. & Supply Co., Columbus.
Dutter, H. O., secy., Elyria Telo. Co., Elyria.
Eaton, O. S., pres., Williams County Tel. Co., Bryan.
Ellis, H. M., mgr., Home Telo. Co., Chillicothe.
Ellis, W. R., secy.-treas., Geneva Telo. Co., Geneva.
Ellis, W. R. Mrs., Geneva Telo. Co., Geneva.
Everett, W. L., engr., North Elec. Co., Galion.
Falls, J. H., Lima Telo. Co., Lima.
Falls, L. M., Miss, Lima.
Fleming, W. E., mgr., Wapakonda Telo. Co., Wapakonda.
Gardinier, F. H., gen. mgr., secy. and treas., Oberlin Telo. Co., Oberlin.
Gillingham, C. A., works dept. mgr., National Carbon Co., Cleveland.
Gott, C. D., mgr., Wellington Telo. Co., Wellington.
Granger, H. L., mgr., Metamora Retchfield Telo. Co., Metamora.
Greggson, W. B., gen. mgr., Tuscarawas County Telo. Co., New Philadelphia.
Guthory, Fred E., pres., Monon County Telo. Co., Monon.
Hagerman, H. E., secy., Black River Telo. Co., Lorain.
Hagerman, Mrs. H. E., Black River Telo. Co., Lorain.
Harrison, John, North Elec. Mfg. Co., Galion.
Herron, M. M., gen. mgr., Millersburg-Wooster & Orville Telo. Co., Millersburg.
Heseltine, W. M., Citizens Telo. Co., Delaware.
Jones, C. L., secy.-mgr., Athens County Home Telo. Co., Athens.
Jones, E. L., mgr., Union Telo. Co., Glouster.
Kipp, C., gen. mgr., Greenville Home Telo. Co., Greenville.
Knapp, Frank A., pres. and gen. mgr., Local Telo. Co., Bellevue.
Krug, F. Wm., Brookins Mfg. Co., Dayton.
Kugelman, C. W., plant supt., Portsmouth Telo. Co., Portsmouth.
Laughlin, Edw. R., wire chief, Athens County Home Telo. Co., Athens.
Leinard, H. O., asst. to vice-pres., American Telo. & Teleg. Co., Cleveland.
Longwell, J. W., gen. mgr., Van Wert Home Telo. Co., Van Wert.
Love, J. D., engr., Columbus.
Lowe, Chas. R., gen. mgr., Williams County Telo. Co., Bryan.
MacDonell, A. D., vice-pres., North Elec. Mfg. Co., Galion.
McBerty, F. R., pres., North Electric Mfg. Co., Galion.
McKinney, Frank L., secy.-treas., Ohio Independent Telo. Assn., Columbus.
McVey, C. Y., director, Mt. Vernon Telo. Co., Cleveland.
Mannix, H. M., Greenville Home Telo. Co., Greenville.
Metheany, C. F., Lima Telo. & Teleg. Co., Lima.
Metheany, Geo. H., secy. and gen. mgr., Lima Telo. & Teleg. Co., Lima.
Metheany, Geo. H. Mrs., Lima.
Metheany, Geo. H., Jr., Lima.
Miller, E. G., gen. mgr., Warren & Niles Telo. Co., Warren.
Mitchell, H. W., dist. sales mgr., Naugle Pole & Tie Co., Columbus.
Neuman, Grace, Lima.
Neuman, O. J., Lima Telo. & Teleg. Co., Lima.
Nichols, W. E., North Elec. Mfg. Co., Galion.
North, C. H., North Elec. Mfg. Co., Cleveland.
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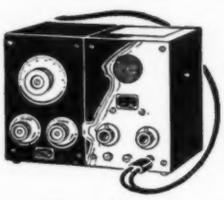

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